Thurſday, *March* 1. 1676
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At a meeting of the Council of the *Royal Society*.

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That a Treatiſe called AERO-CHALINOS; *or a Regiſter for the Air*, &c. *Written by Dr.* Nathaniel Henſhaw, *late fellow of the* Royal Society, *be printed.*

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Aero-Chalinos:

OR,

A Regiſter for the AIR;

In Five Chapters.

1. *Of Fermentation.*
2. *Of Chylification.*
3. *Of Reſpiration.*
4. *Of Sanguification.*
5. *That often changing the Air, is a friend to health. Alſo a diſcovery of a new Method of doing it, without removing from one place to another, by means of a* Domicil, *or Air-Chamber, fitted to that purpoſe:*

For the better preſervation of Health, and cure of Diſeaſes, after a new Method.

The Second Edition.

By *Nathaniel Henſhaw*, M. D.
Fellow of the *Royal Society.*

LONDON,
Printed for *Benj. Tooke* at the *Ship* in St. *Paul's* Church-yard, 1677.

To the Right Honourable THOMAS *Earl of* OSSORY, *Lord Deputy General of* IRELAND, *&c.*

My Lord,

THat the happy Industry of former Ages (whereby we enjoy the benefit

of ſo many uſeful inventions) hath ſtill left matter enough, for the contrivance and diſcovery of ſucceeding times, cannot be better made appear, than by calling to mind, thoſe many worthy improvements, which almoſt all the more Liberal Arts, have received within

within the compaſs of this laſt Century, eſpecially Phyſick, wherein Anatomy alone (I may truly ſay) hath been enriched, by a full third part at leaſt. And herein our own Countrey-men, have been as ſucceſsfully inquiſitive, as any other their Contemporaries whatſoever. No

wonder then if in ſuch an Age, I, imitating their example, have thought fit, to give this account, of my leiſure, to the world; but that I offer it to the protection of ſo great a Patron, the reaſons, perhaps, are not ſo manifeſt, as neceſſary. For, as the Novelty of ſo unex-

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pected a method, as I here propoſe, will undoubtedly expoſe it to the calumny of ſuch, who (rather than give themſelves the trouble of examining the truth of it, being betimes perſwaded, that they already know as much as is to be learnt) will ſoon condemn it, both

of folly and innovation. So it ſeems of abſolute neceſſity, that it bear with it the ſplendid name of ſome great Perſonage, the better to beſpeak the judicious Readers candid Cenſure. Whoſe name then could I more hopefully have prefixed, than that of your Lordſhips, a perſon

ſon ſo Noble by deſcent, ſo Eminent by your Great and Honorable Imployments, and ſo deſervedly beloved and admired of all for that excellent compoſure of Greatneſs and Goodneſs, ſo remarkable in your Lordſhip; which attempt of mine, if it may receive a favour-

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able Interpretation, I ſhall be obliged to continue.

My Lord,

Dublin,
July 1.
1664.

Your Honours moſt humble and moſt obedient Servant,

N. H.

THE

THE PREFACE.

I Hold it not unſuitable to our deſign in this Treatiſe (where I have ſo often occaſion to make mention of it) that ſomething be ſaid by way of Preface, concerning the Air. Not that I intend to treat of its firſt or ſecond qualities, &c. *Which I leave to the natural Philoſophers conſideration, much leſs of the Elaſtic power of it, in Pneumatick Engines; already ſo well performed by others, eſpecially by the Honourable* Robert Boyl, *in his moſt accurate Treatiſe on that Subject: my purpoſe here being only to preſent*

ſent my Reader with ſome few obſervables concerning Air, the better to confirm and illuſtrate what follows in the Treatiſe it ſelf: eſpecially in the Chapter of Fermentation. Firſt therefore, that the Air is of ſome very general uſe, may well appear from its being ſo great an Ubiquitarian, as it is. No place almoſt without it, no body (perhaps) but participating, more or leſs, of it; inſomuch, that even in metals themſelves, the ſound of them, is reckoned an affection of the Air included in them. And if the tranſparency of Bodies be to be imputed to their porouſneſs, or rather to the ſtreightneſs or rectitude of their pores, (as it's almoſt generally agreed on by Modern Writers) it will follow, that there

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is a great proportion of Air in the hardeſt Gems: Which is yet more manifeſt in ſofter ſtones, and becomes the cauſe of their moldring and cracking (after they are taken out of the Quarry, and expoſed to the weather) which ſome ſort of ſtones are very ſubject to: For the impriſon'd Air, that while it was in the cold bowels of the Earth, lay very much condenſed or compreſſed, afterward ſymbolizing with the Air of a thinner Medium, powerfully dilates its ſelf, and after ſome time, ſo weakens the continuity of parts, that at laſt becoming too ſtrong for it, the ſtone breaks into many pieces, which will ſooner happen if the ſame be thrown into the fire: the included Air, in ſuch caſe, with much more violence dilating it ſelf,

ſelf, than in the former experiment. Plants ſeem to owe their very life and being to this included Air: for not having hearts, or other principle of motion in them, (that we know of) for the diſtributing of the Sap: the included Air ſeems to ſupply that defect, after this manner. In the day time, in hot weather, and generally as often as the Air of the Medium, is dilated or contracted: the Air included in the body of every Vegetable, ſuffers after the ſame manner, and has its dimenſions and tone varied. Whereupon theſe two conſiderable effects follow, to wit, that upon the dilatation of the internal or included Air, the parts of the Vegetable are diſtended (ſomewhat) according to their trinal dimenſion, whereby

whereby the Plant grows bigger and taller. And again, upon the compreſſion of the internal Air, room is made for the water or ſap, to riſe up, through the pores of the Plant, exactly after the manner of the Weather-glaſs: where the compreſſion of the Air becomes the cauſe of the aſcent of the water. And thus, according to theſe periods of heat and cold, and the conſequent rarity and denſity of the included Air, and that of the Medium; every Plant makes, as it were, ſo many meals, or is ſo often refreſhed, by the aſcending Sap, which aſcent is alſo not a little promoted, by thoſe gentle Vibrations from the winds, whereby the parts of Vegetables (and conſequently the included Air) are moderately compreſſed and dilated reciprocally

reciprocally; whereupon the foresaid effects follow, even after the same manner, as is said of the Swing, and in the last Chapter of this Treatise. The included Air serves likewise in Vegetables (as in all other bodies) for the maturing and fermenting the juices in them, in such manner as is hereafter expressed. A farther confirmation whereof may be hence had, that the most vegetous plants, and such as we call Ever-Greens, *abound most with Air in them; as appears when they are thrown into the fire, by the violent eruption of it. And there is, I think, no vegetable that has not one great pore or Pipe running from the root to the very top of it. Farther, in the Sea-wrack, or* Quercus Marina, *'tis obvious*

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for every one to obſerve a very particular and curious contrivance of Nature, for the nouriſhment of that plant, by the help of Air, after this ſort. The plant is always faſtened to ſome ſtone; and as it branches out, with jagged leafs, ſomewhat reſembling thoſe of the Oak, it hath ſeveral little Bliſters or Bladders on it, (ſome whereof I have ſeen as big as a ſmall Pullet's Egg.) Now upon the coming in of the Tide, the water riſing, this weed by means of the ſaid Bladders floats; and if the Stone be not too heavy, buoys it up, (and hangs in the water like a Net that hath Corks and Leads to it) whereupon the Plant is conſiderably ſtretched; and again, upon the ſubſiding of the water, receives its nouriſh-

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ment, as in the former inſtance of other vegetables, though perhaps not from the root, being faſtned to a ſtone, but by the porous ſurface of its body. And laſtly, that there is much Air diſſeminated through the bodies of Animals, is manifeſt from their food, herbs and water, both which participate of it in good quantity. A notable argument whereof in water, may be, that it doth upon ſuch eaſie terms, riſe up in a vapour, and mingle its minute and inſenſible parts with the Air. For as the water grows warm, either by the heat of the Sun or fire, the ſmall parts of Air dilating, make haſte to the top of the water, where they frame themſelves, with ſome of the water, into little bubbles, and are carried away by the motion of

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the Air or Medium, like those bubbles made by Children, with Soap and water. And this perhaps may be one reason, why Rain-water is better for plants than other water, because it has more air in it; a testimony whereof the Scale may afford us. And this is manifest in wine even to sense: from which (if it be brisk and fresh, and poured from on high, into a glass) you shall first see a great number of little bubbles, or floating parcels of Air rise up, with such force, as to mount near a foot above the surface of the wine. But it is not enough for us to have proved great quantities of Air in all mixed bodies, unless it be at the same time allowed us, that the Air be actually and formally there as in the Medium or

open

open Air, ſuffering nothing elſe but barely an impriſonment, or confinement only, which is already ſufficiently made out by the uſes lately aſſigned it in vegetables, (unleſs they may be other ways more commodiouſly explained) beſides, that the poſſibility of converting one ſubſtance into another, was yet never ſo clearly taught, as to become intelligible, and has at this day but few Aſſertors of it.

In contemplation of all which particulars; and that the Air alone, of all Simple Bodies, is capable of dilatation and conſtriction (or call it rarity and denſity) yet, not by any power to move, it has of its ſelf, but as it is moved more or leſs, by the preſence or abſence, the nearneſs or remote-

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neſs of the Sun (the heart and Center of this worldly Syſtem in which we live) I thought it a matter worth my pains (though perhaps exceeding my abilities) to aſſay whether all fermentation were not reducible to this ſimple motion of the Air, and did not depend on it, as on a general and more univerſal cauſe; which if I fail not in, it will be no very difficult matter, to reduce all other motions in the world, to that of fermentation, and probably to reſolve many hard queſtions, not as yet ſo rightly determined. But becauſe contemplations of this kind, are, in their own Nature, very unprofitable, if not reducible to practice: I have, as well as I could, applied the ſame to the cure and prevention of moſt diſeaſes;

caſes; as will ſomewhat more at large appear by the enſuing Treatiſe. Which I have ſuffered to undergo the publick view, with this aſſurance, that if the foundation I build on, fail me not, I need not at all doubt the Superſtructure.

Clariſſimi

CHAP. I.

Of Fermentation in General.

1. BY Fermentation, I underſtand that motion obſervable in all compound or mixed bodies, whereby the order and ſcituation of all the minute parts of the ſame, are continually changed, as well in reſpect of themſelves, as of the whole Maſs whereof they are parts: and that, chiefly from an internal cauſe ſo moving or diſpoſing them, (without the local motion of the whole) whether the ſame be accompa-

nied with any ſenſible heat, in the Maſs ſo fermented, or not.

2. That ſuch a motion or fermentation is every where obſervable, we need not go far to prove, if we conſider, that there is ſcarce any thing ſublunary, which is ſubject to our obſervation, that continues the leaſt moment of time in the ſame tenour without alteration, which, if not obſervable to ſenſe, is yet found to be ſo, with as little reaſoning as that the ſhadow upon the Dyal continually moves on, though our eye determine not; till after ſome minutes, perhaps, of time, it becomes apparent that the ſhadow has moved, and then we ſtraight conclude it moved all the while:

and

and that the proportional parts of ſpace, were commenſurate to the reſpective moments in which the ſhadow paſſed from one term to the other: if therefore all bodies are thus moved or fermented at all times, it follows that the Doctrine of Fermentation (according to our acception of the word) is in a manner as far extended as that of Nature it ſelf. I ſhall only conſider it ſo far as it ſeems conducible and ſubſervient to thoſe noble ends I have propoſed my ſelf in this Treatiſe, *viz.* the continuation of health, the cure of Diſeaſes, and the retarding of old Age (to ſay no more, and not to promiſe too much) by a new and hitherto unheard of method.

3. The moſt general properties of fermentation are theſe: that the Maſs ſo fermented ſuffers an eminent alteration in all its uſual ways of affecting our ſenſes, as well in its firſt as ſecond qualities: they are either exalted or depreſſed, they are ſometimes changed for their contrary, and in a word, relation being had to our eſteem of things thus fermented, all fermentation may be ſaid to be either perfective or deſtructive, though in it ſelf it be but one continued flux: as for inſtance in an Apple, or the like, that from a green auſtere bud, firſt acquires its due perfection, and after by a continuation of that fermentation that ripened it, at laſt arrives at corruption, and

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ſo changes both its name and nature together.

4. Another eminent property of Fermentation, is, that for the moſt part the Body fermented doth occupy more ſpace than the ſame did before, which is very evident in the drowned bodies of men or other animals, which though at firſt they go to the bottom, yet after a certain time do ſlowly buoy themſelves up again to the top of the water, not for that the breaking of the Gall becomes the cauſe of their aſcending: (as ſome even knowing men have ſuffered themſelves to be perſwaded) but becauſe ſuch bodies formerly heavier than water, quantity for quantity, and conſequently apt to ſink, have now acquired a

larger dimenſion, while they however increaſe not their weight, and ſo becoming lighter than the water contained in the like ſpace, are protruded by it to the top, where they by degrees ſwell yet bigger: ſo that ſometimes I have ſeen a Dog lye with more than one half of his body above the ſurface of the water, and it is no more than happens in a pound of Glaſs, Metal, or other heavier material, which in a ſolid Maſs ſinks to the bottom, but if blown or wrought into a bottle, it keeps the top of the water: all which together with the reaſon, is well enough known to ſuch as have been converſant in ſtatick Experiments.

5. Another

5. Another very uſeful property of Fermentation is, that while it ſeparates all Heterogeneous parts, it leaves the Baſis as it were, or main ingredient of the Maſs clear and limpid, if not hindred by the denſity of the body, and throws off two recrements or ſuperfluities, one a heavier, deſcending to the bottom, the other of a lighter more frothy ſubſtance, which takes its place at the top of the liquor: as is manifeſt in Wine, Cider and the juyces of other fruits: in Beer made with Barley, and the decoctions of other grains, firſt maulted and grownd. This happens not in Bread, becauſe the greateſt part of the Maſs being more ſolid, the leſs or watry part takes its

ſlight on all ſides to the circumference, though ſomewhat more ſlowly, and there coagulates into a blew mould.

6. Another noble property of Fermentation is, that it exalts the body fermented to what perfection it is capable of, but, then it is requiſite that the body fermented be of ſuch a conſiſtence, as may not be fermented too faſt, as in fruits, upon Trees: or if thin, that it be cloſe ſtop't in ſome full Veſſel, as all kind of drinks: or if of a middle conſiſtence, that it be often ſtirred: which is obſerved by Apothecaries in the making of Treacle, and other ſuch Compoſitions, which afterward will keep a very long time. For thus it is neceſſary, that, that ſpirit,

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(as we will call it for the preſent) which ferments the Maſs, be for a while detained either by the tone of the body, by ſome ſtrong veſſel; or that it be often re-affuſed, as it were, upon its body, that ſo by its long, difficult and reiterated working, it may at laſt find out ſome congruity amongſt the leſs Heterogeneous parts, and cauſe a kind of complanation of the whole Maſs, and it ſelf with leſs reluctancy, be detained in the Body or Maſs.

7. Another very General property of Fermentation is, that all bodies almoſt, by it, at laſt become acid: as is manifeſt in all liquors, decoctions of fleſh, or herbs, electuaries, ſyrups, &c. by which acidity I underſtand

not that ſowr taſte, obſervable in moſt green fruits, which is rather to be termed acerbity, and differs as much from what we here ſpeak of, as Agreſta (the juyce of green Grapes expreſt) doth from Vinegar.

8. In the next place, let us briefly conſider the cauſes of Fermentation, the moſt immediate of which, ſeems to be the Air, contained in every mixt body: for, as I noted before, all bodies fermented, do occupy a larger room, than they did before fermentation: which cannot be duly aſcribed to any other ingredient in mixt bodies, than to the air, for that it hath not yet been found by ſufficient Experiment, that any body whatſoever is capable of rarifaction

faction and condenſation, or dilatation and conſtriction beſides air: as for Leaf-Gold, what it got in one dimenſion, it loſt in the other; and all the parts of Gold calcined, do but equal the Maſs they were made of, no more than if the ſame had been reduced to an impalpable powder by means of a very fine file. The ſame is to be underſtood of water evaporated by heat: which is only a comminution of it, into exceeding ſmall parts, and no way a converſion of it into air (as hath been formerly received) which is from hence evidenced, that ſuch vapours by the Alembic, are again reducible to the ſame liquors from whence they were firſt raiſed, *viz.* into Roſe-water or ſpirit

of

of Wine, which were no more poſſible, if they had been really converted into air, than out of common air to draw Roſe-water or ſpirit of Wine; and if Water, or Milk or other liquor take up more room when boyling on the fire, than they did cold, 'tis by reaſon that the particles of air, formerly not viſible are now conſiderably dilated, ſo as to become obſervable to the eye.

9. As the Air contained in mixt bodies, is the moſt immediate efficient cauſe of Fermentation: ſo it needs exciting and actuating, for the moſt part, as well by the temper and tone of the *Medium*, as from the addition of this or that particular Ferment, as of Leven, Yeaſt, Renet,

Renet, or the like: of which perhaps we ſhall have farther occaſion to ſpeak more hereafter, and at preſent only conſider how the *Medium*, eſpecially the ambient Air, excites the internal Air in the work of Fermentation.

10. By the Tone of the Air, I underſtand the meaſure of its rarity and denſity, and eſpecially its reciprocations or frequent acceſs and receſs to this or that degree of rarity and denſity. Now, that one Air is rarer than another, as that of Hills, than that of the Vallies, that of Southern Regions, than that of the more Northern, is, I think, an undoubted truth: alſo that the Air of every particular place is ſometimes rarer, ſometimes denſer accord-

cording to the ſeveral ſeaſons of the year, times of the day and night, &c. needs no other proof than that of the Weather-glaſs. By the temperature of the Air, I mean its degree and difference of heat and cold, which admits of the ſame conſiderations of place and time as before, and is not only proved by the Weather-glaſs, but even by ſenſe it ſelf.

11. The manner how the Ambient works upon the internal air in mixed bodies, is the ſame with that of the Weather-glaſs, where the incloſed air is rarified, and condenſed, heated and cooled accordingly as the *Medium* is affected: So in bodies fermented, eſpecially liquors, the imperceptible particles of air

air being gently and by degrees dilated, become the cauſe that the whole Maſs doth occupy more and more room, or increaſes its dimenſions under the ſame weight, whereupon this effect immediately follows, that ſeveral Heterogeneous Particles, which before floated in the liquor, and were (as I may ſay) equilibrious with the ſame, do now gently deſcend toward the bottom, in order, according to their weight: The ſmall Particles of air in the mean while being more and more dilated, do, together with the more viſcous parts of the liquor (of which they form themſelves Coats or Integuments) gently aſcend to the top of the Maſs, where they make that frothy head

head or ſcum obſervable in Cider, Wine, Beer, and other liquors; and this I take to be the natural method of all fermentation when not checked, or otherwiſe determined by ſome outward circumſtance: And this alſo ſeems a genuine reaſon of the depuration, and of the caſting off the heavier and lighter recrement mentioned before (N. 5.) to happen in fermented liquors.

12. That Bodies are ripened and acquire their due perfection by Fermentation, is aſſerted N. 6. but in ſuch caſe it is neceſſary, that this fermentation be checked or retarded in ſuch ſort as is there mentioned, both in natural and more artificial fermentations: But the moſt univerſal

verſal Moderator of this motion, is what was lately call'd the Tone of Air, as well as its temperature, which daily and hourly changing, doth accelerate, retard, check and put backward this motion, and then reſtores it again; by which various, and oft repeated courſe, the parts are comminuted, their roughneſs retunded and mitigated, and they ſo diſpoſed of, after an inexplicable manner, as conduces moſt to the beauty and perfection of the Body fermented.

13. This dilatation and conſtriction in Bodies fermented, cauſed by the like accidents of the Ambient Air, may not improperly be compared with the pulſe in Animals, having its *Syſtole*

ſtole and *Diaſtole*, even as they have, though by longer periods, as of day and night, warm weather and cold, *&c.* and from hence perhaps is the true cauſe of pulſes in Animals to be looke for, which yet as forreign to our preſent ſcope we here enquire not farther after; but it will not be improper to obſerve (with common experience) that Malt is beſt made in windy weather, and that the beſt and moſt laſting Beer is brewed in *March* and *September*, (windy months, and of an unequal temper.) Now 'tis evident, that all winds are moved by guſts rather than equal fluxes (from whence probably it is that the Sea is lifted into Waves, as it were numbring to us the ſeveral

ral impetuous ſtroaks it received from the winds.) Thus the motion of all Animals ſeems to be performed by ſnatches and jerks; and it is indeed a great queſtion among School-Philoſophers, whether any local motion be (ſtrictly ſpeaking) continual, and not rather conſiſting of ſhort motions, and frequent reſts, as it were compounded together. This Pulſe, or frequent change in the tone of the Air, however it may ſeem at firſt view an idle or over-ſubtil contemplation, will upon due conſideration, be found not only true, and the cauſe of thoſe effects aſſigned to it in the foregoing Paragraph, but that it may alſo with good effect be made uſe of in Phyſick, as a notable

notable inſtrument for preſervation of health, and the cure of diſeaſes. I ſhall hereafter endeavour to prove in the enſuing diſcourſe. That moſt liquors fermented, eſpecially in the beginning, conceive heat, and become warm, even to ſenſe, the reaſon may be partly gathered out of what has been already ſaid; namely, that the ſmall particles of Air in ſuch liquor become dilated, which dilatation is alwaies accompanied with an increaſe of heat, they mutually making way for, and introducing one the other (in the Air and bodies participating of Air) if not hindred from without; to which may be added, that all motion is apt to beget heat in the Body moved,

moved, which is true not only of ſolid Bodies, though more eminently in them, but alſo of liquid Bodies themſelves. Thus 'tis ſaid in making Butter, you muſt neither make too much at once, nor yet muſt it be too violently beaten or ſhaken, for in ſuch caſe there will be great hazard of over-heating the Butter, which, as you ſee, is the meer effect of motion in a liquid Body only: Beſides, moſt liquors fermented, abound with a kind of Tartar (which afterward ſubſideth, when the Maſs begins to cool) the colliſion of whoſe rough particles one againſt the other, may perhaps ſomewhat contribute to the production of this heat, though I for my part impute leſs to this,

this, than the cauſes before aſſigned, though the remarkable heat ariſing in *Aqua fortis* affuſed upon filings of Iron or Silver, is perhaps beſt made out by the colliſion of its aſprous parts againſt thoſe of the ſaid Metals.

14. As concerning particular ferments, I ſhall only obſerve, that congenerous Bodies ſuffer moſt, and are beſt fermented by their own proper ferments, namely Ale by Yeaſt, Dough by Leven, Milk by Renet. Thus Apples, Pears and Grapes, and generally all fruit, once corrupted or rotten, do more eaſily affect and putrifie thoſe of their own kind than of any other; I ſay more eaſily, for they will, though with more diffi-

difficulty, and after a longer time, corrupt fruits of a diverſe kind alſo; and thoſe particular Levens before-mentioned, will in like manner (though probably not ſo naturally) ferment other Bodies of whoſe kind they are not: Thus Yeaſt will ferment Dough (which yet ſeems ſomething congenerous to it, as proceeding it ſelf originally from Corn or Grain;) and whites of Eggs beaten up into a ſnowy froth, will indifferently ſupply the want of Yeaſt, in either Wort or Dough; nay, I am verily perſwaded, that the Yeaſty froth which may be taken off the top of ſome running Drills of water, would effect the ſame, mingled with Dough, unleſs perhaps it be not

not viſcous enough, wherein it ſeems only to differ from the whites of Eggs beaten, as is ſaid; and it were worth the trying, to underſtand, whether a Maſs of Dough made with flower and ſnow only, would need any other raiſing or Leven. I have read, that in the Countries about *Parma* and *Piacenza*, whence thoſe ſo much valued Parmiſan Cheeſes come, the people make uſe of Snow inſtead of Renet. This inſtance however of the white of an Egg beaten, may ſerve very well to illuſtrate our Poſition concerning the fermentation of Bodies by the dilatation and conſtriction of its aereous particles: as alſo the kneading of Dough, and ſhaking of liquors

(which

(which is a kind of kneading too) the better to make them riſe and work, will notably confirm what we ſaid of the Tone of the Air, its frequent alterations, and of windy weather, how much they conduce to the better fermentation of moſt Bodies.

15. Note, that the reaſon why the juyces of moſt fruits do ſoon after expreſſion acquire a ſtrong fermentation, ſeems to be this, that not only the liquor is now more at liberty, than when mixed with the fleſhy parts of the fruit, but likewiſe that the Airy Particles lay very much compreſſed in the fruit, every particular Grape, Cherry and Apple, being in the nature of a little Bottle, which as we

ſee, if well ſtopt, hinders the working of Ale or Wine, but once opened, the liquors ſtraightway ferment and ſwell very impetuouſly, the compreſſed Air forcibly dilating it ſelf; and this is the reaſon that fruit a little eaten by the Birds or Snails, will ripen much faſter than if they had not been entred upon, (but then the taſte will not be altogether ſo generous and ſprightly.) Thus Apples and Pears gather'd green and hoarded, ripen ſooner far, than if they had continued hanging on the Trees, for that they now receive ſome vent at their ſtalks; and I find the Ancients were wont to plant the *Caprificus* (or wild Fig tree) near their other domeſtick Fig-trees,

that

that ſo the Flies, which in great quantities are bred out of the fruit of the *Caprificus*, may ſeiſe and pierce the Figs of the other trees, as they do in ſeveral places, thereby not only accelerating their time of maturity, but alſo (which perhaps is particular to this kind of fruit) rendring them much more tender and delightful than otherwiſe they would have been, had no ſuch Artifice been made uſe of. Now, as we have ſaid, this kind of Fermentation whereby fruits attain their maturity, bears a very due proportion with that obſerved in bottled drinks, which if well ſtopt are ſlower in ripening(but of better taſte) than in open veſſels: as alſo if placed in cold well-vaulted

Cellars, than if expoſed to the Air: and that for this reaſon, that the difference of heat and cold (eſpecially in Summer) is by many degrees more in the open Air, than in ſuch ſubterraneous Vaults, and conſequently the Aereous Particles, contained in ſuch fermented liquors, are more dilated and conſtricted (reciprocally) when expoſed to the weather, than if laid up in Cellars, or buried in the ground. Which reciprocation of the tone of Air, we have already aſſerted to be the principal, if not the only cauſe of all Fermentation. And it may be farther illuſtrated, by a common practice of bottling up Wine, or other drink, with a lump of Loaf-ſugar in it, which

which will make it much more brisk and lively. And this it doth, not by its ſweetneſs ſure, for that were apter to clog and tame it, as is found by practice; or if it did, then ſyrup of Sugar, or a ſmall quantity of powder Sugar, might indifferently produce the ſame effect: which yet is contradicted by experience. Nay, I dare confidently affirm, that the like quantity of the ſame Loaf-ſugar, firſt done into very fine powder, will not ſerve the turn. So that I cannot imagine other reaſon, why the lump of Loaf-ſugar is of that uſe, put into bo tled Wine,&c. than that being very porous, it conveys with it ſelf, a great quantity of air into the liquor: and does in

effect no more, than what has been already ſaid of the whites of Eggs beaten up together into a froth. So it is not the Sugar, but the Air contained in the Sugar, which mends the fermentation of the drink, and whereby the Sugar ſupplies the place of an additional ferment, the better to excite the working of the liquor.

16. And laſtly, Methinks it might alone ſerve turn, to convince us of the great efficacy the air hath, and the power it exerciſeth on all, or moſt mixed Bodies: what we find ſo manifeſt by experience in preſerving of fleſh, fruits, the Bodies of Inſects, and other the like, whether for aliments or curioſity only, and that with little

other

other preparation many times, than by barely immerſing them in Wax, Oyl, Butter, Sewet, ſome Gum or Rozin, &c. and afterward carefully putting them up into Veſſels well ſtopped. By which practice we ſeem to obtain little elſe, than that we do hereby, as it were, conceal thoſe Bodies, thus preſerved, from the air, which would otherwiſe, in a ſhort time, have totally corrupted them: their long continuance and preſervation ſeeming to follow, as the conſequence of that artificial excluſion of the air, whereby the Bodies (or rather the air in them) are no longer apt to be affected, according to the various diſpoſitions of the *Medium*.

Farther, It is well worth our Obſervation, that Chyle, Milk, Cream, the ſeeds of all Vegetables, and even that of Animals it ſelf, ſeem to owe their whiteneſs to the interſperſion or diſſemination of air only; even after the ſame manner, as is already obſerved in Snow, and ſome other Bodies.

CHAP.

CHAP. II.

That Chylification is a ſort of Fermentation, and how diſtribution is performed.

1. THe Stomach or Ventricle in animals, deſigned by Nature for the Office of Chylification, commonly called the firſt Concoction (and which is, as it were, the root of all Vegetation or nutrition in them) ſeems at firſt birth but ill fitted for ſuch a work, till the Coats or Membranes thereof, have been well ſtained or

ſeaſoned by the receipt of an aliment ſo prepared, that it wants little more than warmth, to the perfecting of that operation upon it, which is expected from the Stomach. And thus, for all animals that ſuck, Nature has provided for their firſt food, a kind of corrupted Milk, uſually called Beaſtings, which gives, as it were, the firſt tincture to their tender Stomachs, and whereby they ſeem enabled to concoct more perfect Milk, which they begin to draw after a day or two. Which Milk alſo by degrees becomes more thick, and harder of concoction, proportionably to the increaſe of ſtrength, in the Stomach it ſelf, till by little and little, they begin to alter

their diet, and forſake the Teat, for ſuch other food as is moſt proportionable to their reſpective Natures.

2. This Tincture, thus imprinted on the Stomach, may very properly be termed a Ferment, and ſeems to bear a juſt proportion with Leven, which is a ſmall part of the Maſs of Dough, ſuffered to grow ſowr, while the reſt is converted into bread, which, if not hindred, would have all turned into Leven likewiſe. Thus after the Chyle is conveyed from the Stomach into the Guts, from thence to be diſtributed through the whole Body; ſome ſmall part that remains ſticking to the coats of the Stomach, ſoon after acquires that

acidity,

acidity, due to all fermentation not interrupted : which after ſome time begins to grieve and afflict the Stomach with its ſharpneſs: the ſenſe whereof, we uſually call hunger : which ſenſe of pain (or hunger) continues to grow more and more, (that which cauſed it becoming ſtill ſharper and ſharper) till by the reception of new aliment, the acidity of the ſaid Tincture or Leven, be ſo mitigated and allayed, that the Stomach being, as it were, healed by application of theſe new, benign, and uncorrupted juyces, is no longer ſenſible of any pain or moleſtation : which then puts an end to the deſire of eating. But if food be forborn, or withheld, the pain ſo long increaſes,

increaſes, till it at laſt deſtroys the ſenſe of the part, and introduces a Sphacelus, Gangrene or Mortification in the Stomach: which is afterward ſoon conveyed to the Heart and Brain, by its communion of Veſſels, and ſo at length becomes the death of the Animal. Which ſeems rather to be the cauſe of death, in ſuch as periſh by hunger, than the emptineſs or inanation of the Veſſels, which, though much exhauſted, are yet found in ſuch caſes, with a conſiderable quantity of blood in them. Nay, 'tis a frequent practice in the Deſarts of *Arabia* (as I am informed by ſome that have Travelled in the *Levant*) to let their Camels blood after

ſeveral

ſeveral days faſting, and to give them their own blood to drink, as the laſt means leſt to preſerve their lives. Which practice, as it cannot repleniſh the Veins, to that meaſure it already emptied them: ſo it evidently concludes, that emptineſs of the Veſſels, is not the true cauſe of periſhing for want of food. Much leſs can the continuation of Suction, from the exhauſted Veſſels to the Stomach, be the cauſe of Hunger. For firſt, Such hunger could not be immediately appeaſed after eating, the Veſſels receiving no part thereof till a conſiderable time after, when diſtribution begins to ſucceed concoction, as is well known and confeſſed. Secondly, 'Twill

appear

appear to ſuch as ſhall duly conſider it, that the Veſſels or Veins are then fulleſt, when the Stomach is emptieſt *(& è contra)* the emptying of the Stomach, beginning with the filling of the Guts and Veins. Nor ſhall we need other arguments againſt this Suction, (though it were eaſie to charge it with more difficulties) than that the owners of it will be forced to prove, there is ſome ſuch power of moving by attraction, drawing or ſuction, which will be a harder matter than it appears at firſt ſight. Though as not making to our preſent purpoſe, I ſhall not determine ought concerning it.

3. In

3. In confirmation of this our Aſſertion, *viz. That the concoction of the Stomach is a kind of fermentation*, it will not be amiſs to ſhew the reaſon of ſome circumſtances of it. And firſt, concerning that preparation, which meat receives in the mouth by chewing or jawing of it, which is rather a bruiſing than mincing: and it is a common obſervation, that fleſh minced very ſmall, is of much harder concoction, than if eaten by bigger pieces; and a ſufficient reaſon is withal aſſigned, that Meat minced, ſlips down into the Stomach before it be duly maſticated or chewed; which is ſo neceſſary an antecedent of concoction, that the *Arabian* Phyſicians are wont

wont to ſay, *That he that chaws not his meat well, hates his own Soul.* Now that any thing bruiſed will ſoon after corrupt, is evident in all Fruits: which will ſooner putrifie, after bruiſing, than if they were cut with a ſharp knife into many pieces. Thus a fleſh-wound, made without bruiſing, will commonly heal again with little or no corruption, but not if the part were bruiſed at the ſame time. Thus the common practice is to bruiſe Whitloes, to ripen and break them the ſooner. And thus, to conclude, our meat by being bruiſed, becomes of much eaſier and ſpeedier concoction; which ſeems to be the reaſon why Nature has given to moſt Creatures, namely,

namely, *Dogs*, *Wolves*, *Swine*, *Foxes*, *&c.* three ſorts of Teeth, to wit, Tusks to kill their prey with; ſharp Fore-teeth or cutters, wherewith they tear it into ſmaller pieces; and laſtly, Grinders to chew and bruiſe it, the better to prepare it for the ſtomach.

Birds ſeem to grind their meat in their Gizards, after it is firſt well ſoaked in their craps, for which purpoſe they pick up ſharp ſtones, and their ſtomachs are made of two large Muſcles; one, on either ſide: the chief inſtruments in this work of Moliture, or grinding. The *Locuſta* or Lobſter has his Teeth placed in his ſtomach, and ſo have the reſt of that kind, which they employ for the ſame

4. Our next obſervation ſhall be upon two Rules of Diet, commonly given by Phyſicians: the one is, that we ſhould not put new meat into our ſtomach, till after a perfect digeſtion of what was eaten the meal before: the reaſon of which Rule, ſeems to be this, That it is neceſſary the ſtomach ſhould continue ſome time empty, that ſo the Fracid tincture, or ſmall corrupted remaining portion of the former meat, may have acquired its due acidity: whereby it may the better help the ſucceeding fermentation or concoction. And it is no more than if you ſhould adviſe the Houſe-wife, not to make any new Bread till the Leven be grown ripe, or ſowr enough to leven

leven and ferment the Maſs of Dough. The ſecond Rule is, that we ſhould leave eating, with ſome ſmall appetite to eat on; or that we ſhould riſe from Table with an appetite: the reaſon is almoſt the ſame with the former, and may well be illuſtrated by the ſame inſtance, which is, that it is requiſite, the Leven ſhould bear ſome juſt proportion to the Maſs it is to ferment. Thus if we riſe with an appetite, it will appear that we have not overcharged this ferment of our ſtomachs, for Appetite being, as is ſaid, a ſenſe of pain cauſed by the ſharpneſs of this acid ferment; it follows, that this acidity is not yet quite obſcured by the late mixture of food

food, and conſequently the ſtomach, not charged with more than may be well digeſted at once by it. And theſe are Rules very fit to be obſerved, as well by thoſe which are of a more robuſt nature, as of them (eſpecially) who have weak ſtomachs, and find themſelves indiſpoſed after eating.

5. 'Tis further adviſed by ſome Phyſicians, that ſuch as have weak ſtomachs, ſhould forbear drinking till they have near dined: and we commonly obſerve, that drinking juſt before dinner ſpoils our eating, which it does, by diluting this ferment of the ſtomach, whereupon the ſenſe of pain, and conſequently hunger, abates very much, or quite ceaſes for a time.

And

And 'tis uſually ſeen, that they who are great Drinkers are bad Trencher-men: and that as well, for that much drinking relaxes the tone, and extenuates the coats of the ſtomach, as more eſpecially, for that it waſhes away by little and little all this acid tincture, or ſowr ferment, of the membranes thereof, which is as well the cauſe of concoction, as of appetite or hunger.

6. *Bulls*-blood drunk, was found a preſent poyſon by the Ancients, and Milk taken plentifully, and after curdling on the ſtomach, has often been the cauſe of great and mortal Surfeits: the reaſon of both is the ſame; for that, both Blood and Milk being curdled, and

brought

brought into one hard lump, becomes insuperable to the stomach. Whereas, if the same be suffered to coagulate (before they be eaten) and broken into small parts, they will have no such effect, and instead of poysoning, will afford an indifferent good nourishment to the body: So far seems *Helmont* to have missed the mark, when he says, *The cause of this poyson is, Imago Iræ, in Sanguine Taurino.* And I doubt not but a lump of Beef, or a piece of Cheese of the same bigness, whole in the stomach, would as surely poyson, if not more effectually. And this may farther confirm what is said in the third Paragraph, of preparing our Food, by chawing, &c.

7. The

7. The inward membranes or skins of the Gizards of moſt Birds (eſpecially ſuch as feed on Corn) prepared, by drying and powdring them, are held a great help to concoction. Now the acidity of them is very manifeſt, and no doubt they do no otherwiſe comfort our ſtomachs, than by increaſing and corroborating that ferment ſo often mentioned. Thus, the Dung of ſeveral Animals prepared, namely, of *Wolves*, *Dogs*, *Peacocks*, *&c.* hath been approved of in divers diſeaſes, or diſtempers of the Stomach and Guts, for the ſame cauſe. Nay, I have heard that *Paracelſus*'s Occidental Civet prepared, will make an excellent Peptick, for them that can

can diſpenſe with ſuch homely remedies.

8. It is a famous Queſtion among Phyſicians, Whether it be better to make a meal of one only diſh of meat, or to eat of ſeveral meats at the ſame ſitting? and it is commonly determined, in favour of the ſimpler diet. But it ſeems more conſonant to our Opinion, to allow rather of ſeveral diſhes; for that which is eaſie of concoction, will help to concoct that which is harder. Thus good Sauces to meats, make them ſit eaſie and light upon the ſtomach: the Sauces (being eaſie of concoction) helping the diſſolution of the meats. and we may ſurely expect a heartier nouriſhment from them,

than ſingle diſhes; as we find by experience, better broth to be made of ſeveral ſorts of fleſh, than of any one; and commonly the more variety, the more perfect is the Pottage. And its well known, we are nouriſhed by juyces only, and not by the ſolid part of our food.

9. Where this ferment of the Stomach is more acid than is requiſite (as it is in Hypochondriacal perſons, and ſuch as are troubled with ſowr belches) 'tis found by experience, that to make two, three, or four meals in a day, is better than one: and that faſting increaſes much the acidity. That hard meats, as dry Bread, Biſcuits, and thoſe that are of leſs eaſie concoction

coction, are more uſeful than Broths (and other light meats:) which will ſometimes (eſpecially taken in a morning, the ferment after long emptineſs becoming extraordinary ſowr) work ſo violently, that they will flow up into the mouth, and with their eagerneſs ſet the teeth an edge, and ferment the very ground. But, both in this and the former Rule, it will be neceſſary to take ſome care, that we do not eat much more of our Many diſhes, than we ſhould have eat of one, and that the quantity of our meat at many meals, but equals, or not much exceeds, what we ſhould have eaten at once or twice.

10. 'Tis obſerved, that ſudden change of diet has ſometimes proved very fatal, and been often the occaſion of dangerous diſeaſes. The reaſon may well be, that the ſtomach, having received its tincture or ferment from food of another nature, is but ill prepared for the concoction of thoſe meats to which it hath not been accuſtomed, and from which it hath as yet received no ſtain or impreſſion. Such changes therefore muſt be made by degrees; and thus I have heard, that Horſes have been brought to live upon fleſh: and ſome men, have indifferently well ſupported life with Bread and Herbs only.

11. *Wolves*

11. *Wolves* are ſaid, when preſſed with extremity of hunger, ſometimes to tear the ground and fill their Panches with meer Earth: which ſurely affords them little or no nouriſhment. But it ſerves for the preſent, to abate the edge of their appetites till they meet with ſome prey, at which time they eaſily diſcharge their ſtomachs of the Earth, and fall to better meat. This inſtance may indifferently well ſupport our Aſſertion, *That hunger is rather a ſenſe of pain from the acid ferment of the Stomach, than of emptineſs from the Suction of the veins.*

12. As concoction ſucceeds beſt with reſt, ſo motion is ſaid to help diſtribution: Now by diſtribution, we are to underſtand the diſperſing of the thinner parts of the Chyle into the milky Veins, from thence into the Subclavials, thence into the right Ventricle of the heart, where the Chyle already is pretty well ſtained, or imperfectly mingled with blood: from whence it takes its courſe to the Lungs, where, by the reciprocations of that part, it is yet more perfectly mixed with the blood. From the Lungs, it deſcends into the hearts left Ventricle: from whence, it is thrown into the Arteries, where, by degrees, it receives the form and name of Blood:

Blood: and by them is conveyed into all parts of the body. In regard the milky Veins have no attractive power, whereby the Chyle might be ſuckt into them (as far as could yet be fairly made appear) nor has the Chyle (much leſs) any ſuch inclination or power of moving it ſelf that way; it remains, that this diſtribution of the Chyle is performed by the motion of the body. And thus we find moderate exerciſe ſoon cauſes an emptineſs in the firſt ways, and begets an appetite. And yet we may likewiſe obſerve, that while we ſit ſtill or ſleep, this diſtribution is performed, though not ſo ſpeedily. Now, while we reſt, there is no other motion obſervable

beſide that of breathing, which ſeems to be the true cauſe of this diſtribution of the Chyle, till it comes into the Subclavials: for when we draw-in our breaths, the Diaphragm or Midriff compreſſeth the ſtomach, and gently forceth the Chyle thence into the guts. And again, when we breath-out, the Muſcles of the belly ſtraight ſubſide, and ſtrongly compreſs the guts; whereupon the thinner part of the Chyle inſinuates it ſelf into the mouths of the milky Veins, and by the ſucceeding parts of the Chyle, is protruded into the Subclavials, where afterward it is moved with the motion of the blood. I do not deny the Periſtaltick motion of the Inteſtines,

tines, (whereby the guts diſtended with Chyle beyond their due tone, do again by their tranſverſe fibres contract themſelves) for this is alſo a partial cauſe of diſtribution (as appears in the diſſection of live Animals, where this motion of the Chyle continues after the Abdomen or Belly is laid open from one end to the other) but is much ſtrengthned, no doubt, by the Muſcles of the belly; beſides, this Periſtaltick motion of the guts ſhews indeed, in part, how they are emptied, but not how they are filled with Chyle, which is the firſt part of diſtribution.

13. 'Tis worthy obſervation, that Butter melted, and very well beaten (or drawn) a while, becomes a much pleaſanter Sauce, and eaſier of digeſtion, than if it be not beaten; and yet all the difference is, that by beating, a great quantity of Air is every where mingled with it, whereby it very much helps the fermentation or concoction of our meat in our ſtomachs, after the ſame manner as is already ſaid of whites of Eggs in the former Chapter; and indeed all Sauces are a kind of additional ferments. That there is great quantity of Air in Butter thus beaten, may not only be gathered from hence, that after beating it takes up more room than it did before,

or

or otherwiſe would do, if not beaten; but the ſame particles of Air are even manifeſt to ſenſe it ſelf, and the whole Maſs of Butter appears beaten up into a froth; ſo far is it from being made thicker thereby, (as we commonly expreſs our Opinions of it) that indeed it becomes much thinner and lighter, if compared quantity with quantity, as is manifeſt.

CHAP.

CHAP. III.

Of Reſpiration.

N. 1. THat Animals breath not at all, while in the womb, is moſt probable, that all viviparous creatures, after the birth, cannot live long without breath, is moſt certain; yet I do not find the uſes of Reſpiration ſo clearly determined, but that it may afford us matter for further enquiry. The common received Opinion is, that Reſpiration ſerves chiefly for cooling the heart, next that, it yields matter for production of new vital ſpirits; and laſtly, that it diſcharges the lungs of a fuliginous excrement, which ſeems

ſeems to trans-ſude from the Maſs of blood into the branches of the rough Artery: that the heart is cooled by breathing, is very probable, but not immediately; for the air going no further than the lungs, firſt cools them, next the blood in them, and conſequently the heart becomes leſs hot, than otherwiſe it would be; but this is, in effect, no more than is obtained by bathing the limbs in cold water, which does altogether (if not more effectually) cool the Maſs of blood, as much as the air in breathing can be conceived to do it, and yet bathing will in no wiſe become a Subſtitute to breathing. Nor does the generation of vital ſpirits ſeem to be the chief uſe of the air in breathing,

breathing, in regard it is not eaſie to conceive any ſuch contrivance in the lungs, that may ſerve for the letting in of air, into the veins and arteries, which contain the blood, without endangering, contrariwiſe, the effuſion of that precious juice; much leſs has Anatomy, as yet, diſcovered any ſuch paſſages unto us. Laſtly, as I ſhall not deny, but that the lungs do diſcharge themſelves of a fuliginous excrement by breathing; ſo I think it as true, that this is none of the principal uſes of Reſpiration. Nor is it at all likely, that either the heart ſhould grow ſo hot, or that the vital ſpirits ſhould vaniſh ſo faſt, or the fuliginous excrement be accumulated in that quautity,

upon

upon the intermiſſion of breathing for a ſhort time only, as to endanger our lives beyond recovery, as the abſolute neceſſity of Reſpiration would ſeem to enforce. Before I come to deliver my own Opinion, I ſhall make a ſlight digreſſion concerning the circulation of the blood, which will not a little illuſtrate what we are about to ſay concerning this Subject.

2. 'Tis manifeſt in the circulation of the blood in Animals, that the blood is moved from the left Ventricle of the heart, through the great Artery, into all its branches, from whence it is brought back by the ſmaller veins, which diſcharge themſelves into the Vena Cava, from whence it is returned into the

right

right Ventricle of the heart, from whence it is ſent by the Vena Arterioſa into the lungs, and ſo brought back again into the left Ventricle of the heart by the Arteria Venoſa: And in this circular motion of the blood, life chiefly conſiſteth: and if the ſame by any chance ſhould ceaſe or intermit, though but for a very ſmall time (leſs than a minute) death would unavoidably follow. In this motion of the blood, it is obſervable firſt, that as the pulſation of the heart ſendeth it through the Arteries, into the whole habit of the body, ſo the return of it by the veins, ſeems to depend chiefly upon the tonical motion of the body; for the parts being extended by the

flowing

ſlowing in of the blood, ſome-what beyond their tone, do a-gain gently ſubſide, and thereby continue the intended courſe of the blood toward the heart a-gain. An argument hereof is, that all Paralytick parts grow immediately cold, and that for no other reaſon, than that the tonical motion, together with the power Locomotive, ceaſing, the circulation is either very weakly, or not at all performed through that part, which then grows cold, for want of that conſtant freſh ſupply of blood, which formerly kept it warm. But herein the tonical motion is not a little helped by exer-ciſe and labour, which we find, by experience, to cauſe the heart to beat quicker and oftner, as

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alſo to induce a neceſſity of breathing more frequently ; and this it doth no otherwiſe , than by accelerating this circular motion of the blood , which then enforceth the heart and lungs to double duty, Our ſecond obſervable in this circular motion of the blood is, that there paſſes as much blood from the right Ventricle of the heart into the lungs, at every pulſe (taking one time with another) as is ſent from the left Ventricle into all the parts of the body beſide. Nor can it be otherwiſe, the left Ventricle being ſupplied from the lungs only ; and the lungs receiving it, not elſewhere than from the right Ventricle of the heart. So , that to continue this circular motion of the blood,

blood, 'tis neceſſary, the ſupply neither exceed, nor come ſhort of that quantity, diſpenſed from the left Ventricle of the heart, into the whole body (the Lungs excepted.) From hence it follows, that there flows a greater quantity of blood, by many degrees, into the lungs, than what is ſufficient for its own private uſe. As alſo, that the blood in the lungs, muſt of neceſſity, move very much faſter, than it does in any part of the body; though we take for example, the great vein or artery themſelves: and that, in the ſame proportion, as the *Vena Arterioſa*, and *Arteria Venoſa*, are ſmaller than the trunks of the foreſaid great veſſels. For, let the ſame quantity of liquor be conveyed through

through a pipe, whoſe capacity is but one fourth, or one tenth ſo big as another pipe, through which the like quantity muſt paſs in the ſame time: and it is evident, the liquor muſt run four times, or ten times as faſt, through the ſmaller pipe, as it does through the greater. And thus, it appears, that a very conſiderable part of the Maſs of blood is continually running through the Parenchyma of the lungs; and that, at a much ſwifter rate, than it doth through any part of the whole body beſide.

3. Farther, before we proceed to treat of the uſe of Reſpiration, it will not be amiſs to conſider, what kind of motion that is which the lungs are exer-

exerciſed with, in breathing. Nor is it any other, than a motion of dilatation and conſtriction; whereby the lungs are reciprocally opened and ſhut, ſomewhat after the manner of a pair of Organ-Bellows: the air entring into them, when dilated or opened, and receding again, upon their ſubſiding. And this is what we call Reſpiration. Nor yet, does this reciprocation of the lungs, proceed from any power to move, they are endowed with of themſelves. For, if we conſider, the frame and ſtructure of them, they will appear of a Parenchymous kind of ſubſtance, not much unlike the liver, and altogether void of Muſcles; without which, no local motion can be

be performed. We may conclude therefore, that the lungs are moved by conſent, and that chiefly of the Diaphragme or Midriff, in a free and ordinary breathing. But, in any difficulty of breathing, as in the Aſthma, Tabes, violent exerciſe, *&c.* not only the Midriff, but almoſt all the Muſcles of the trunk of the body, namely, thoſe of the Belly, Cheſt and Shoulders, ſeem to afford their aſſiſtance. In this great work of Reſpiration, The motion of the Midriff is firſt downwards; whereupon the lungs follow, and the air is admitted, and again upwards; whereby the lungs are compreſſed, and the air excluded. Thus you ſee, that as the conſtruction of the Midriff, ſo is its motion,

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ſomewhat different from that of other Muſcles; which, as being well known, we ſhall not need to ſpend longer time about, but come to the publick uſe of the lungs, in the Oeconomy of our bodies.

4. In the circulation of the blood, we aſcribed the reduction of it again into the right ventricle of the heart, to the Tonical motion of the body; where yet, as we have ſaid, the blood moves but very ſlowly, if compared with that ſwift and rapid motion, it is carried on with through the lungs; where it moves, perhaps, ten times as faſt, as in any other part of the body, as has been already proved. Which notwithſtanding, we ſhall not be able, upon peruſal of

of the ſtructure of the lungs, to conclude, that they are endowed with any conſiderable tonical motion, as may be gathered, as well from their want of Muſcles, as for that their ſubſtance is very ſpongy and flaccid ; and their common integument is but one thin membrane. Nor was it without a particular, and that a moſt excellent deſign: that Nature thus contrived the lungs with little or no tonical motion in them. For firſt, had this Tone been equivalent to the Maſs of blood, to be returned by it; it would much have retarded the influx of the blood into the lungs, and conſequently, have hindred a great work of Nature upon it there, as ſhall be ſhewed hereafter. But chiefly, for that

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it has largely ſupplied ſuch defect, by the aſſiſtance of the Diaphragme: which becomes the cauſe, both of dilating and contracting the lungs, according to the occaſion, and at the will and pleaſure of the Animal. And this is, indeed, the firſt and principal Office of the lungs; as to what concerns their reciprocal motion: Namely, that upon the ſubſiding of them, in Reſpiration, the blood may be vigorouſly ſqueezed out of them, through the *Arteria Venoſa*, into the hearts left Ventricle. And becauſe, the ſubſtance of the lungs is very tender; Nature contrives, that not the Diaphragme immediately, but the air incloſed in the cavity of the breſt (for this very purpoſe only) being firſt,

ſtreightned and crowded, as it were, together, by the motion of the Diaphragme upward, ſhould cauſe this compreſſion upon the lungs; while by its Elaſtic power, it endeavours to dilate it ſelf again, to its uſual dimenſions. Nor could any way of compreſſing the lungs, (thereby to diſcharge them of the ſuperfluous blood) have been contrived more equal: for this pent air, is as apt to preſs upon one part, as on another. Nor yet more gentle, and ſecure: for what contact could have been more delicate, or leſs apt, to wound the tender membrane of the lungs, than the air incloſed in the breſt about them? Nor need any doubt, but that the air, thus compreſt and ſtreightned,

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is of ſtrength ſufficient for this ſervice: and that there is ſuch a Spring in the air; who, ſhall but conſider with what force, the air breaks forth of the Wind-gun, and other Pneumatic Engines. A farther confirmation hereof, may be had from hence; that ſuch wounds, as perforate the breſt, if left open, but for a little time, do quickly cauſe a difficulty of breathing: and I do not much queſtion, but if both ſides of the breſt were perforated, it would as certainly diſpatch a man, as hanging; and that, almoſt, in as ſhort a time. Farther, in the diſſection of live Animals, Reſpiration continues, long after the Abdomen or belly is laid open; but immediately ceaſes, upon divi-

ding the Diaphragme or Midriff.

5. Whether the air, that enters into the lungs, by the Wind-pipe, have a ſhare in this compreſſion of them, for the diſcharging of the blood, or not, I am as yet not well ſatisfied. At firſt view, this compreſſion ſhould ſeem, to be beſt made upon drawing in our breath; between the air implanted in the cavity of the breſt, and the air, in the rough Arteries: (or branches of the Wind-pipe) but at ſuch time, the implanted air, is but little or not at all contracted: and therefore we muſt conclude, that either the air taken in, bears no part in this compreſſion: or which is moſt probable, that the ſanguine Veſſels of the lungs, are

are not only ſtrongly compreſſed, upon expiration, but alſo upon inſpiration; that is, ſo often, as the lungs are removed from their natural, middle, or indifferent ſcituation: whether expanded or contracted. *Viz. Tàm in quiete externâ, quàm internâ.* We muſt likewiſe allow the air to cool the lungs very conſiderably, and that it diſcharges them of a fuliginous, or rather vaporous excrement. But theſe are, as we have ſaid, the leſs principal uſes of Reſpiration. As for the airs becoming the matter of Vital Spirits in Reſpiration, I ſhall ſay no more, than that *I* neither find any need of it, nor any way for the mingling of it, with the Maſs of blood.

6. Allowing what has been ſaid, concerning the uſe of Reſpiration; we may, perhaps, find out a more commodious reaſon of ſighing, than has been yet aſſigned. For, if a man ſhall for a while, either wholly forbear breathing; or, at leaſt breath ſeldomer and lower than is his uſual cuſtom; the lungs, in the mean time, ſwell and fill themſelves with blood, (for want of that frequent and ſtrenuous compreſſion, formerly equal to the influx of the blood,) while the pulſe is not ſo full as ordinarily: the hearts left Ventricle not receiving its due ſupply from the lungs, which in this caſe receive more than they deliver: Hereupon a man is neceſſitated, (for avoiding ſuffocation)

tion) to fetch a great breath, or ſigh, which may more ſtrongly, than uſually, compreſs the ſubſtance of the lungs, and reduce them to their former eſtate. And thus, great attention, any deep contemplation, ſad thoughts, and a melancholick conſtitution; do often become the cauſe of frequent ſighing: As alſo, a natural ſloth, or leſs aptneſs in the lungs themſelves, or Diaphragm, to motion; will ſometimes make this paſſion cuſtomary, and habitual. And it is obſervable, that the pulſe riſes very much upon ſighing; for the firſt ſtroak, or two, at leaſt; the blood coming to the Artery again, in that abundance, that a man may feel the tingling of it, at his very fingers ends.

2. Furthermore it may not a little ſtrengthen our Aſſertion, that in all great difficulties of breathing, and where there is moſt imminent danger of ſuffocation, to let blood in good quantity, is commonly preſcribed, as the laſt remedy: and which ſeldom fails, of giving, at leaſt, a preſent relief, let the cauſe be what it may be. And this it ſeems to do, by diverting the courſe of blood from the lungs, while they gently again diſcharge themſelves of their burden. And in caſe of hanging, or ſtrangling, letting of blood in great quantity, has ſometimes ſaved mens lives that have been executed; and this by no other ways, that I can think of, than by helping to diſcharge

charge the lungs of their oppreſſion, as has been already ſaid.

8. And thus we have, if our Opinion fail us not, diſcovered the true uſe of Reſpiration. We have alſo of conſequence, freed the heart, of almoſt one half of the task impoſed on it, by the modern Phyſicians. For ſince the circulation of the blood conſiſts of two parts, *viz.* Firſt, the conveying it from the heart, or center, to the reſt of the body, as to a kind of natural circumference. And ſecondly, the returning, or bringing back of the blood again, to the heart; The firſt part, we conceive to be the Office of the heart: The ſecond part, ſeems to be the work of every particular mem-

ber, to diſcharge it ſelf of its own ſuperfluities : For which purpoſe, nature hath endued them with a tone, or tonical motion, ſufficient for that ſervice, the lungs only excepted, wherein Nature hath worthily imployed her induſtry, by the additional contrivance of Reſpiration, through the aſſiſtance of the Diaphragme: which labour of the lungs, in Reſpiration, for the returning of the blood to the left Ventricle of the heart; ſeems to equal that of the tone, or tonical motion, of all the other parts of the body; for the lungs convey the ſame quantity, with all the reſt : that is to ſay, the whole Maſs of blood, through them; and that in as little time, as the ſame paſſes

through

through the reſt of the body. And, if it carries it not ſo far, it moves it ſo much the faſter. And ſo, we ſhall have entitled the lungs, to one full quarter part, of this work of the circulation of the blood, leaving another quarter to the tonical motion of the body: And the firſt, and worthier half, of diſpenſing blood and life through the whole body, to the heart, as its proper office and duty. What part, the lungs may juſtly claim to themſelves, in the buſineſs of Sanguification, we ſhall more conveniently find place to conſider of, in the following Chapter.

CHAP.

CHAP. IV.

Of Sanguification.

N. 1. THe Chyle, when ſeparated from the remaining unprofitable parts of our Aliment, is, by proper veſſels of its own (the diſcovery of modern Anatomiſts) conveyed directly into the Subclavial veins, and from thence into the right ventricle of the heart, where it is mingled with a larger quantity of blood, returning home by the great Vein, together with which it is immediately tranſmitted to the lungs, where (though it make great

great haſte through, and moves very impetuouſly, as hath been ſaid) yet by reaſon of the length of the way, it continues a conſiderable time, and is more perfectly mingled with the blood, and wrought up together with it into one Maſs, and at the ſame time acquires both the name and form of blood (as Phyſicians term it) and ſo is fitted for the heart, from thence to be diſtributed to the reſt of the body: where, after what manner it is circulated, we ſay not, as a thing already ſufficiently known, and whereof we have delivered our ſenſe already.

2. That Chyle is very eaſily mixt with blood is evident, for that it is the matter whereof all blood

blood is made, by a farther continuation of that fermentation or concoction, begun on it in the ſtomach. Nor yet is the proportion ſo great between them, but that upon mingling, the diſſimilitude of parts becomes immediately the cauſe of an extraordinary ebullition: which is very much increaſed by the reciprocal motion of the Lungs, whereby the blood is wrought almoſt into a froth or foam by that time it gets into the left Ventricle of the heart. Which ſudden exceſs of heat, is not unlike what happens upon the mingling ſeveral Chymical liquors together, as Spirit of *Wine*, and Spirit of *Turpentine*, and other ſuch like, where the heat becomes ſo great

great, that it often endangers the veſſel they are contained in. And this is the cauſe of that heat a while after meals diſcernable in Hectical perſons, and others, otherwiſe affected: and which in many appears, by flushings in the face. Now that the blood is wrought up to that froth we ſpeak of, during its paſſage through the Lungs, is not only ſuitable to reaſon, but appears moſt evidently in thoſe ſanguine excretions from the Lungs, which happen in conſumptive perſons: nor does that frothineſs, then obſervable, proceed from the mingling with it the air we breath, for that at one breathing out (or expiration) could not be ſufficiently performed.

3. The

3. The Blood, by ſeveral very learned men, has not unaptly been compared to Wine; and in my Opinion, the Chyle may as properly be likened to the juyce newly preſſed out of the Grapes: which, if it were by certain intervals, in a due proportion, poured gently into new Wine, or Muſt, as it begins to cool, would again renew its ebullition, and continue the warmth of it to what degree is requiſite, and that ſo long as this practice ſhall be continued. And from this Illuſtration, may be clearly gather'd the neceſſity and uſe of eating, at leaſt within certain periods or intervals: to wit, that by the frequent affuſion of Chyle the blood may again recover its motion;

motion, warmth and vigour, without which ſupply it would ſoon languiſh, cool and congeal, and conſequently death enſue. Now, that the Lungs are indeed the principal *Officina Sanguinis*, may be farther collected from Conſumptions of the Lungs, wherein all parts of the body are ſo ſuddenly extenuated, by the affection of the part.

4. 'Tis probable, that the blood during its ſtay in the Lungs does not actually dilate it ſelf, and riſe into froth, but only acquires an aptneſs ſo to do, as ſoon as it is at a little more [illegible] as appears in blood ſpi[illegible] of them; and conſequently, when it falls into the left Ventricle of the heart, it immediately dilates it ſelf with

with great force, in the manner of bottled Beer; and in this manner does, for ought I know, in great part become the cauſe of the *Diaſtole*, or expanſion of the heart, which being extended beyond its due and natural ſcituation, does again violently contract it ſelf by a power almoſt all bodies have of reſtoring themſelves, and which we call, the Tone, or Tonical motion. And, as we obſerve in a Switch bowed down, or in a Pendulum removed out of its place, that they return beyond the perpendicular: ſo it fares in this motion of the Heart, whereby it is again more contracted than is natural to it, and ſo of it ſelf returns again to expand it ſelf, and is again violently

violently diſtended, as before, by the influx of more ſpumy blood from the lungs. Now, though it may be objected, that the pulſe in the heart continues, many times, a long while after it is taken out of the body; and when there is no longer any ſuch influx to be pretended, as the cauſe of it. To this I anſwer, that ſuch pulſe, is what the Phyſicians call the *Myurus*, or Mouſe-tail, for that its Diadromes, or differences between greateſt and leaſt expanſion, do continually become leſs and leſs, even as it happens in *Pendulums*, once removed from the perpendicular, which continue their motion for a long time after the hand is from them, that firſt ſet them awork. At leaſt this ebullition

ebullition of the blood in the heart, ſeems not a little to contribute to the continuation and ſtrengthening of this pulſive-motion. In contemplation of this *Orgaſmus*, or Fury, as I may call it, in the blood iſſuing out of the lungs, and now to be diſtributed into all parts of the body, Nature contrived the Arteries with thick and double coats, the better to contain it: whereas the Veins deſigned for the carrying it back again to the heart, at what time the blood is very much cooled and tamed, are only made of ſingle membranes, as being ſufficient now to hold it. And this is all the difference between Arterial and Venal blood.

5. It

5. It ſeems of all other Opinions the moſt probable, that the blood, when arrived at the extremities of the ſmalleſt Arteries, is there ſhed upon the habit of the body, in the belly, or fleſhy-part of every Muſcle; each Muſcle having the proportion or likeneſs of one of the quarters, or *Acetabula* in an Orange or a Lemon; upon the compreſſion of which, either by local or tonical motion, it is not hard to conceive, how the blood is again forced into the mouths of the Veins; and after the ſame manner has every Muſcle its particular Membrane. And thus we find, that blood iſſues forth upon pricking the fleſh in any place; although it cannot be imagined, we ſhould always

always prick a Vein or Artery: or we muſt conclude, there is nothing elſe in fleſh, but a multitude of capillar Veins and Arteries, which were abſurd to be aſſerted.

6. To make ſhort: Life it ſelf is but a continuation of this vigorous fermentation of the blood, which is ſo long maintained, as the Maſs of blood is kept hot, and circulating through the Veins and Arteries; and if done by thoſe means, and in that manner, which is ſuitable to Nature, ſo long the body is in perfect health. If it be too violently fermented or moved, it does in general become the cauſe of Fevers, and other acute diſeaſes: as contrariwiſe, if the fermentation be too weak,

weak, from thence all Chronical diſeaſes take their original: and that particularly according to the ſeveral irregularities that may happen, either in exceſs or defect, in this fermentation and circular motion of the blood. We deſcend not now to particulars, the moſt we aim at in this Treatiſe being but a general Method, either of preventing or curing diſeaſes, after a way not yet treated of.

7. Since the diſcovery of the circulation of the blood, it has been the Opinion of many great Aſſertors of it, that where the indication is of letting blood, it matters not out of what Vein it be taken, provided ſo many ounces be let out as the diſeaſe requires.

requires. And this their Aſſertion is made probable, by many Arguments alledged by them for that purpoſe; and, but for the tonical motion of the habit of our bodies, would be as great a Truth as any is in Phyſick. But the tonical motion of the parts once admitted, We muſt likewiſe grant, that thoſe parts will empty themſelves firſt that lye neareſt to the inciſion; as well, for that there is leſs ſtrength required to force any liquor to a ſhorter, than a longer diſtance: as alſo, becauſe the more remote parts, or Muſcles, do exerciſe a kind of *Antipraxia* or Contranitency, and ſo become of mutual impediment one to the other: whereas the nearer parts, do almoſt immediately

mediately diſcharge themſelves upon the Orifice, or inciſion.

8. From this tonical motion of the whole body, it happens, that any particular part is ſometimes preternaturally ſwelled, either from a ſtroak, the application of Cupping-glaſſes, or generally any other cauſe, which may weaken the tone of the part; for in ſuch caſe, the heart continuing its motion for the diſtribution of the Maſs of humors, it is very eaſie to conceive, that more of them will paſs into that part where leaſt reſiſtance is made, than otherwiſe would have happened, had the part continued in its natural tone and vigour.

9. From hence likewiſe the reaſon is to be ſought, how it happens in letting blood, that ſo large a quantity ſhould in ſo ſmall a time iſſue out at the inciſion made in one Vein, and that perhaps none of the largeſt. For if we duly conſider, how quickly a man may bleed to death, by the opening (for inſtance) of a Vein in his arm; we muſt conclude, that the blood paſſes not much faſter through the heart, than it does at the ſame time out of the Orifice in his arm; and that conſequently, there is but little blood received, during this evacuation, into the reſt of the body, which doth then by its tone diſcharge it ſelf (into the great Vein) of its *Plethora*,

or

or ſuperfluous blood, which returning again from the heart toward the habit, the greateſt part takes its way to the part where the inciſion was made, it finding there no other oppoſition, than what it has while it is travaſated from the Arteries into the Veins, through the ſmallneſs of their mouths, which yet is in part recompenced by the multitude of them. Now, if it be agreed on, that in half an hour a man may bleed to death, or thereabout, if a Vein in the arm be kept open: and that there will, in ſuch caſe, be about one half of his blood let out, computing what is likewiſe contained in the capillar veſſels, and what remains in the habit of the body, it will follow, either

that the whole Maſs is compleatly circulated twenty four times in twenty four hours, or a natural day. Which ſeems a little too often, or that the blood circulates much faſter while a vein is breathing, than at other times, which is not improbable; or that a man may continue bleeding longer than half an hour, which is not ſo likely: or that there is not in ſuch caſe of bleeding to death, one full half of the Maſs let out: All which may deſerve a more exact ſcrutiny, but muſt now be left to be decided by the Experiments of ſuch as are converſant in the diſſection of live Animals.

10. It

10. It is frequently ſeen in Horſes, that upon long and much labour they loſe the ſight of their eyes; nay, I have known ſome Horſes that have loſt one or both eyes with one days over-ſtraining, either by draught or courſe, and ſo became blind of a ſudden. And then we commonly ſay, *They have drawn their eyes out*: But how the Eyes ſhould ſuffer, or what part they take in the labour or violent exerciſe of the body, is not ſo eaſily made out, unleſs by this tonical motion of the body, which now becomes much ſtrengthned by the violent local motion, either in drawing or running, whereby the Muſcles of the whole body are much more compreſſed,

than in their natural ſtate of reſt, and conſequently, do not only not admit of the uſual quantity of blood and humors, due to them by circulation; but by their violent and frequent contraction, do return them back in a much larger proportion, than they now receive them; whereupon the Lungs become over-charged, which cauſes frequent breathing, and makes the pulſe quicker and ſtronger than formerly, diſtends the great vein and artery with a greater quantity of blood than is uſual: Whereupon the Artery, by its pulſe and tone, endeavours to diſcharge it ſelf upon the habit of the body, which not receiving it in its due and accuſtomed pro-

proportion, the blood does in a more than uſual manner fill the veſſels of the eyes, (and other weak parts) and either by diſſention, compreſſion, or extravaſation of blood, or other humor, the order and diſpoſition of the part of the Eyes becomes ſo confuſed and diſturbed, that no wonder if blindneſs immediately, or ſoon after do enſue. Now, 'tis manifeſt from hence, that where the body of a Horſe is clean, that is to ſay, not ſo full of humors; and where blood abounds not over-much, this accident ſhall not eaſily happen. And here we are to obſerve, that though the native tone of the Eye do rather exceed that of the other parts, than come ſhort of it,

yet it is not ſufficient to reſiſt this influx, when the tone of the other parts is ſo much ſtrengthned by the violent local motion of the body.

11. If we a little reflect upon the manner of the Circulation of the Blood, and how by very modern diſcovery, the Chyle is firſt mingled with the blood, in the axillary or ſubclavial veins, from whence it paſſes by the right Ventricle of the heart, through the lungs, into the left Ventricle; from thence to be diſtributed into the whole body: One thing very remarkable will ariſe to our obſervation, namely, that what part of the blood is ſent toward the head by the Carotides or Arteries of the neck, flows

flows thither very crude, and accompanied with all its excrements, it having not yet received or ſuffered any depuration, or alteration, from the Reins or Spleen, like that which paſſes into almoſt all other, eſpecially the lower parts of the body (though indeed it ſeems not to be cleanſed of the Gall, till it returns home again through the Liver.) Now, though Natures purpoſe herein be very obſcure, that the blood thus impure ſhould be deſigned for the ſervice of the moſt Noble part, yet, that ſo it is, will farther appear by the ſeveral Emunctories (or ſinks) wherewith the head is in a particular manner provided, as the ears, eyes, noſe, palat; every of which diſcharge

the brain of a ſeveral excrement, and that no longer uſeful to the body, except what is ſecerned by the palat, which is for the moſt part again returned to the ſtomach: for the better ſeparating of which, Nature has induſtriouſly placed about the head ſo many of thoſe ſerous veſſels, called the *Ductus Salivares*, which ſeem here to perform the ſame Office to that part of the blood ſent to the head, which the Reins do execute to the remaining Maſs. Hence no wonder it is, if exceſſive drinking do ſo much weaken the brain, cauſe Catarrhs (which is nothing but an overflowing of the *Ductus Salivares*) weaken all the faculties of the Soul and ſenſes, and at length enervate the

the whole body, although at the ſame time the Reins do their duty indifferently well; and this eſpecially, if the native tone of the brain be weak, it being then ſo much the leſs able to diſcharge it ſelf of ſuch ſuperfluous excrements. This may be ſaid in general, that the blood is thus ſent to the brain before depuration, in regard of its publick Office, that the ſame may there be farther elaborated, as ſhall beſt ſuit with its ſervice in that Noble part. Thus much by way of an uſeful digreſſion may ſuffice, concerning Tonical motion, and ſome conſiderable circumſtances of it; which, as well for the aſſiſtance it gives the heart in the circulation of the blood,

as for the many uſeful indications from thence airſing, in the Doctrine of Phlebotomy, was moſt properly to be handled in this Chapter of Sanguification.

12. And now I do not much doubt, but whoever ſhall have carefully peruſed what has been lately ſaid concerning Sanguification, and the uſe of the Lungs; will as readily conclude with me, that the Lungs do bear a very principal part in the work of Sanguification, for in them the Chyle is perfectly mingled with the blood; in them one half part of the circulation is performed; and in them the blood ſeems to free it ſelf, firſt of all from any excrement: to wit, a fuliginous, or rather a vaporous watry ſuper-

ſuperfluity (which paſſeth out together with our breath.) And this ſeems the firſt and chiefeſt part of Sanguification. The ſecond, is a farther elaborating the Maſs of blood in the arteries, which is performed by the pulſive motion of the heart. The third and laſt part, is the depuration of the blood, whereby its ſuperfluous excrements are ſeparated from it: and this is performed by the reſt of the bowels thus; by paſſing through the Reins, it is dreined of its ſerous parts: Another excrement it ſeems to leave behind it in the Spleen, though of what kind, is not yet well determined among the modern Phyſicians: But on all ſides it is concluded, that while it paſ-

ſes

ſes through the Liver, as through a Streiner, it is there purged of choler, which in moſt Animals is collected in a little bladder or *Ciſtis*; from whence it is tranſmitted to the Inteſtines, where it becomes a kind of natural Clyſter, and provokes to the excerning the excrements of the firſt ways, as they uſe to term them. And this is what lay in our way, to ſay at preſent, concerning Sanguification.

CHAP.

CHAP. V.

That often changing the Air, is a friend to health: Alſo a diſcovery of a new Method of doing it, without removing from one place to another, by means of a Domicil, *or Air-Chamber fitted to that purpoſe.*

N. 1. HAving hitherto ſhewed, what part the air acts in all Fermentations, and that in reſpect of its tone and temper;

temper; *viz.* its difference of rarity and denſity, and of heat and cold; and that in general only: not conſidering what other diſpoſitions of the Air may make it apt to promote or retard the motion of Fermentation; whereby it may alſo powerfully operate, to the continuation or deſtruction of mixt bodies: as not ſo directly ſerving for the illuſtration of the Subject we principally intend in this diſcourſe. Having farther made it probable, that the work of our ſtomachs upon our Aliments, as alſo, that Sanguification it ſelf is a kind of Fermentation. And laſtly, having aſſerted the publick Office of the Lungs, together with the uſe of breathing, as well in promoting

moting the circulation, as elaborating of the blood. And having likewiſe ſaid ſomething of the tonical motion of the body; and all this, after a manner ſomewhat different from what has been hitherto received and taught in the Schools. It remains, that from theſe Phyſiological ſpeculations we proceed to raiſe ſome Medicinal concluſions and contrivances, very uſeful for the cure, as well as prevention of ſundry Diſeaſes.

2. But firſt, it will be neceſſary to premiſe, That the Atmoſphere, wherein we breath and live, is heavy or ponderous, and preſſes more or leſs upon all bodies in it; and upon all ſides expoſed to it; and

that

that eſpecially, according to its difference of rarity and denſity. So that upon the tops of very high hills, and in bright weather, the Atmoſphere will lye lighter upon us; and all other bodies than the ſame will in thick weather, and in deep valleys; and conſequently, that we move with more difficulty when the air is thick, and with more eaſe when the ſame is thinner; which is as much as to ſay, that the reſiſtance of the *Medium* is proportionable to its meaſure of rarity and denſity. All which we now take for granted, and ſhall ſpare our ſelves the pains of proving, as what hath been already ſufficiently made out by ſeveral Learned men in this our Age:

from

from whoſe Writings, ſuch as doubt may receive very ample ſatisfaction. And we ſhall only conclude, that if all motion be eaſieſt performed in the thinneſt air, then in ſuch an air we ſhall breath freer, digeſt our meat better, and be leſs tired with walking or working, than in a thicker air: and conſequently, perform all the functions of life better, as is indeed manifeſt even to experience it ſelf; (which yet is wont, for the moſt part, to take notice but of the more groſs Obſervables) for who almoſt is there of ſo happy a conſtitution, that during health it ſelf, and in the prime of his years, is not in ſome meaſure affected by the alteration of the weather, and

by

by the change of the air? for, as for ſuch as are ſick, the very moments of life and death, do ſeem to depend upon this change: and ſuch as are Valetudinary perſons, commonly find to their great grief, that their own bodies may indifferently well ſupply the want of a Weather-glaſs, in admoniſhing them, not only of the changes of the weather, but of the ſeaſons of the year alſo. So very conſiderable is this alteration of the Air to all mixed bodies, eſpecially Animals, and among them to men more particularly, as being leſs armed againſt the injuries of the air; and among men, moſt of all to ſuch as are infirm; as hath been ſaid.

3. Now

3. Now, if the Natural and Vital Functions are better and easier performed in a purer air, than in a courser; no wonder, if upon changing the worse for the better air, many (especially Chronical) diseases do, by degrees, from thence receive a cure: which were before invincible, by other remedies; or must have been patiently endur'd till the alteration of the season of the year introduce that chang in the air, (as to its tone and temper) which is sufficient so to rectifie the motion of the humors in our bodies, as at length to overcome the distemper. Which might possibly have sooner been obtained, by a seasonable removal into a wholesomer, warmer, or dryer Region.

gion. But it is much more remarkable, that not only the changing a bad air for a better, is available in ſuch caſes; but much more the often changing of the air, though ſometime for a worſe, which is not only confirmed by experience, but likewiſe by the Authority of *C. Celſus*, who ſtrictly enjoyns it, and adds this as a reaſon, that if a man reſide in ſo good an air, that he knows not where to remove to a better, yet it will be profitable for him to remove, and that often; for in caſe of ſickneſs, that may juſtly be eſteemed the worſt air, as to the concernment of the Patient, in which the diſeaſe took its beginning. The reaſon (in groſs) why changing the air at all,

ſhould

ſhould cure diſeaſes, may be this; that the body of man is capable of enduring a greater latitude, either in the tone or temper of the air, than what the diſeaſe thus curable can conſiſt with; and perhaps no other Animal is able to endure that variety of Climes, that a man may indifferently enjoy himſelf in. And thus men are found to inhabit in all parts almoſt of the habitable World, whereas other Animals are proper to this or that particular Region, and will either die, if tranſported into other places, or at leaſt loſe much of their vigour, and not generate. The ſame is alſo obſervable in plants. 'Tis ſaid, that Lice bred on this ſide the Line, (or Aequator) will immediately

diately all die on the other ſide the Line: So that it follows, the Pthiriaſis, or Lowſie diſeaſe, will be ſpeedily cured by ſuch a change of the air or Clime; and all, or moſt other diſeaſes, do ſeem to bear ſome Analogy in their exiſtence, to the life of that deſpicable little Animal. But that the often changing the air, is ſo much a Nobler Remedy, than that of removing once for all into the beſt air: The reaſon is ſurely this, that firſt, in the finer air, the motion of Fermentation of the humors, and juices of our bodies, is better performed, and ſomewhat accelerated; and again, a little retarded, by a ſpeedy remove into a groſſer air, whereby the humors are, as it were,

were, kneaded or carded; and the diſeaſe at every ſuch change, receives a notable ſhake, which ſeems to be much more ſenſible (if I may ſo ſay) of every ſuch impreſſion, than our bodies are. And this often changing the air, does well reſemble the many ſtroaks, which are neceſſary to fell the ſturdier Oak, while one or two, though very conſiderable ones, are not ſufficient to bring him to the ground. I ſhould therefore from hence conclude, that if once changing the air, do not in ſome reaſonable time give aſſurance of a cure, that then we doubt not, with the Judicious *Celſus*, to change, as often as ſhall ſeem convenient, which ſurely will, (other helps not neglected) at

length (provided the diſeaſe be curable) put an end to, and wholly eradicate the diſtemper, be it almoſt what it may be.

4. But it will not be amiſs, to be a little more particular, in ſhewing, after what manner the air works upon our bodies, and affects them with its ſeveral alterations, and differences of rarity or denſity. And firſt, I think it will be granted by moſt men, and might be clearly proved by ſeveral experiments, that there is a certain quantity of air in all liquors, inſenſibly diſperſed in very minute parts, through the whole Maſs of them, which ſmall particles do actually ſymbolize with the Medium; and will, by contracting or dilating them-

themſelves, cauſe the liquor wherein they reſide, to take up ſometimes more, and ſometimes leſs room; as will be manifeſt to him, that ſhall fill a large glaſs bottle, of about a pottle or more, with water, till it riſe two or three inches in the neck, which will need to be very ſlender, and ſomewhat long, and it will ſoon appear, that the water ſhall ſometimes riſe, and at other times fall, almoſt after the manner of ordinary Weather-glaſſes; as will be much more manifeſt, if it be for a while ſet near the fire, ſo as to be a little warmed by it. Now the humors and juices of our bodies, have likewiſe their certain proportion of air in them, and that in a far greater meaſure, than common

water, which ſeems of all other liquors to contain the leaſt (as is probable from the ſmall inclination it has to be fermented) and therefore it ſeems to follow, that upon all changes in the Air, or Medium, the juices of our bodies are affected: (even after the ſame manner, as has been ſaid of common water) and that according to the alterations of the Weather, of day and night, and of the ſeaſons of the year. Which alterations, or changes, in any one particular place, have a kind of orderly method of ſucceeding one another, but much different from that of another place or Region, which, though it have the like alterations of Weather, Seaſons, &c. yet the order or

method

method of this variety, is as it were, of another Scale from that of the former. And the differences of heat and cold, denſity and rarity in the Medium, are either greater or ſmaller, than thoſe of the former: whereby the body removed from the place of its former abode, to another, is affected with the varieties aforeſaid, after another manner than what was uſual to it. Whereby the face (if I may ſo ſay) or complexion of the humors and juices in the body, will be much altered and changed from what it lately was; and conſequently, the Morboſe Character very much defaced, if not wholly obliterated. Which effect will in all probability more certainly ſuc-

ceed upon often, than upon once changing the air, as has been already ſufficiently evinced, both from reaſon and experience.

5. Of all changes of the air, that is commonly obſerved to be moſt effectual for the cure of any diſtemper gotten abroad; which is made by removal from a forreign Country, to a mans own Native Soil, or the place of his birth, and firſt abode: which ſeems to be true (*cæteris paribus*) from hence, that the Aereous Particles, which originally go, as one principal ingredient to the making up of the body, were at firſt of the ſame tone exactly with that of the Medium: and it cannot be imagined, but that upon any con-

conſiderable removal, theſe Aery Particles muſt be more or leſs dilated, or contracted, than they formerly were, whereby the body will be preternaturally affected. Which though during the ſtate of health, it be not cauſe ſufficient, perhaps, to manifeſtly hinder any action of the body; yet in caſe of a diſeaſe, it ſeems to be a notable relief to Nature, to be reſtored again to its Native conſtitution (as far as is poſſible) which is a kind of renewing, and no ſmall refreſhment to the body: from whence a Patient ſeldom fails of a relief, and very often finds a perfect cure, in ſeveral contumacious diſeaſes.

6. I would not be ſo far miſunderſtood: as if I aſſerted the alterations our bodies ſuffer from the *Medium*, to be exactly the ſame, in degree, with thoſe of the Weather-glaſs; for that I think were hardly conſiſtent with perfect health, as we find theſe alterations in moſt perſons are; though in infirm bodies they are very manifeſt. But I ſuppoſe, by this time it may be expected from me, that I give an account of this difference, and ſay how it comes to paſs, that the air in our bodies is not affected by the *Medium* exactly after the manner of the Weather-glaſs, but in a leſs degree, where for the only reaſon I can think of, I ſhall aſſign the tone or toni-

cal

cal motion of every body, ſo often mentioned; which being compreſſive of all the parts of our bodies, it very conſiderably checks and hinders that dilatation of the humors, by means of the rarified air, which would otherwiſe enſue upon the like affection of the *Medium*: which compreſſion or reſiſtance of the tone or tonical motion of the body, may be very well illuſtrated from a bottle full of (nothing but) air, well ſtopt, and afterward expoſed to the differences of heat and cold. In which caſe it cannot be imagined, that the included air is at all either dilated, or contracted: not the firſt, becauſe there is no room for it to expand it ſelf upon,

nor yet the laſt, becauſe the ſides of the Bottle are not apt to ſubſide, without which no ſufficient reaſon can be given, why the air, upon external cold, ſhould quit any part of the place it formerly repleniſhed. And yet, in ſome caſes, the differences of heat and cold may be ſo great, as to prevail over the ſtrength of an ordinary bottle, and break it, as hath been often found by experience. But here we muſt obſerve, that though the ſides of the Bottle give no way at all to the air included, yet the tonical power of the body doth ſomewhat yield to ſuch alterations of the humors; and that more or leſs, according to its different ſtrength in the body,

of

of this or that Individual. Nor doth this Experiment of the Bottle ſufficiently conclude, but that, at leaſt, the compreſſion of the air in our bodies ought to anſwer that of the *Medium*: and indeed, that it doth not, ſeems to proceed from the internal heat in the humors of Animals, (maintained, as is ſaid in the Chapter of *Sanguification*) which is of power ſufficient, not only to reſiſt the compreſſion of the tone, or tonical motion of the habit of the body, but that of the *Medium* alſo. And ſhould the contrary happen, death would inevitably enſue.

7. It may be farther noted, that all bodies (whether Men, or other Animals) are not equally

qually affected with the ſame change or alteration in the *Medium*; but, as hath been ſaid, proportionably to the ſtrength of the tonical power of each body. And thus it happens, that a perſon of a Robuſt conſtitution and habit of body (whether ſuch naturally, or acquired by much travel and labour) will with leſs trouble and hazard of his health endure any notable alteration, or change of Weather or Soil, than another of a finer texture and compoſure; and whoſe tone conſequently is not ſo reſiſtive of the impreſſions from without, as that of the former. And thus it is eaſie to conceive, why a perſon inhabiting near either of the Poles of the Earth, and

and removed to, or near the Æquator: or the contrariwiſe, will find the temper of the Clime more troubleſome and offenſive to his health, than he ſhall, that from the middle temperate Region ſhall transfer himſelf to either of the Extreams. And no doubt, the leſs the difference is, the eaſier and ſooner ſhall a man's Nature be brought to comply with it. And thus we obſerve, that *Spaniards* and *Portuguezes* do with leſs danger travel and trade into the more Southern Regions of the World, than Northern men can do, who are commonly not otherwiſe ſeaſoned, than by ſome dangerous Calenture, Flux or Spaſm, or other deplorable diſeaſe, whereby much the greater

greater part of them are commonly deſtroyed. All which diſeaſes are no other, than the effects the *Medium* hath upon the Air impriſoned in our bodies; which, if it find the humors eaſily diſpoſed to a farther degree of fermentation, than what is conſiſtent with health, it produces a Fever or Calenture in ſome bodies; in others, a dangerous Flux: and in ſome moſt violent Spaſms, upon the forcible dilatation, either of the Air in the nervous parts, or of that, which may poſſibly be, in the ſpaces between the Muſcles.

8. From hence probably it is, that the fruits of thoſe hotter Countreys are ſo dangerous, eſpecially to ſtrangers; for that

that they are no ſooner received into the body, but they are ſtraightways very violently fermented (and after the ſame manner ferment the juyces of the body, to the diſordering of the whole frame) inſomuch, that the juyce of ſome Plants is accounted a deadly poyſon, as that of the Root of *Yucca* (while the ſolider parts are made into a kind of wholeſome bread) and poſſibly for no other venemous quality, than its over-active fermentation, whereby it not only diſturbs, but deſtroys the Oeconomy of the body. All which, and much more of this kind, that might be produced, ſeems in great part to depend upon the fineneſs or rarity of the *Medium*, which

which lying lighter on liquors, and other bodies thus fermented, ſuffers them more eaſily and more violently to expand themſelves, than, for the moſt part, is ſuitable with the health of ſuch as eat them, eſpecially in any conſiderable quantity.

9. And now, from what hath hitherto been ſaid, it may ſeem exceeding probable, that the Air doth conſiderably alter and diſpoſe the humors of our bodies, eſpecially upon changing one Clime for another; and that our bodies do, more or leſs, ſympathize with the preſent tone and temper of the *Medium*; whereby it is not only freed from ſeveral diſtempers, but may alſo very often be thereby variouſly diſaffected, and

and caſt into divers dangerous diſeaſes. But yet, how uſeful ſoever the changing of the Air may be for the cure of any Infirmity: we find it ſtands with the convenience but of very few to make ſuch removals; for that they cannot well diſpenſe with the leaving their Families or Relations, together with other their familiar affairs or employments. Beſides, Phyſicians are not apt to adviſe their Patients to it, till they have firſt, in vain, employed moſt other remedies in the cure of them; whereby commonly the opportunity is loſt, and the ſick perſon deprived of that benefit he might, in all probability, have received upon a more ſeaſonable removal. Beſides,

ſides, many times it would be neceſſary, not only to remove to ſome neighbouring place or other, but even to take a journey of ſome hundreds of miles, which cannot be performed by the ſick, but with great difficulty. So that, what through one impediment or other, the thing happens to be but rarely put in practice; and ſo Noble a Remedy is not only neglected, but in a manner brought into diſeſteem with ſome, for want of more frequent examples of the great uſe of it; while they cannot give themſelves a ſatisfactory account, how ſuch a change of Air ſhould ſo conſiderably work upon our Bodies.

10. Now, to the end we may not want the help of ſo generous a remedy; and for the better avoiding the fore-mentioned inconveniences in the uſe of it. *I* hold it a matter of no ſmall compendium in this place, briefly to ſet down and ſhew the manner of a certain Contrivance, how any perſon may receive the benefit he may expect, upon removal from his abode to any other place (with intent to change the air) and that almoſt indifferently at any ſeaſon of the year, without ſo much as removing out of his own houſe, or neglecting any occaſions whatſoever. Firſt therefore, in ſome fit place near, or adjoyning to your houſe, erect a convenient Room of about

bout ſome 12 or 14 foot ſquare, or of what ſize you pleaſe, either bigger or ſmaller than the former, and let it be exactly well cieled, or vaulted over head, and well paved; or otherwiſe ſo floored at bottom, that the air may not have any vent to get either out or in, nor yet through the walls, which it is requiſite ſhould be of Brick or Stone, and well plaiſter'd on the inſide; and let the windows be likewiſe ſo contrived, that no air may paſs in or out that way, which the eaſier to prevent, and that they may be alſo the ſtronger, and leſs apt to crack, they ought not to be very big nor many. The door muſt be likewiſe ſo contrived, that it may ſhut into its frame ſo exactly, that when

it

it is made faſt there may not be the leaſt paſſage left for the air to get in or out of the foreſaid Chamber: the particular manner and contrivance of doing all which I do not here ſet down, for that I doubt not, but that there are ingenious Maſons and Joyners, that will much exceed any directions that I can be able to give them. Your Air-chamber being thus made, you muſt farther provide your ſelf with a very large pair of Organ-Bellows, which muſt be placed in ſome convenient part of the Room, where, by the help of a Skrew, the Noſe of them may be exactly joyned to a Copper Pipe, whoſe other end muſt paſs through the Wall of the Room, and have a Valve opening outward,

exactly

exactly fitted to it, as is uſual in Water Engines: and if the ſaid Valve be placed in water, it will do much better. This Brazen Pipe muſt likewiſe have another Valve to open inward, and both ſo contrived, that either of them may be ſet open at any time, or taken off, while the other is imployed. The Bellows being thus fitted, and the door and windows cloſe ſhut, you may, at pleaſure, either fill the Chamber with Air, by forcing in what quantity you pleaſe, till there be twice or thrice as much as there was at firſt, till the ſame be as thick as is requiſite. You may likewiſe diſcharge the Chamber of one third, one half, or more of the air it had at firſt in it, till you have

have on the contrary, brought what remains, to that degree of Tenuity (or thinneſs) is required, and this by the help of the Bellows; which if the air be to be forced out, muſt lie with their moveable part upwards; and the innermoſt Valve of the Brazen Pipe, before mentioned, muſt either be taken off, or kept conſtantly open; but if air is to be forced into the Chamber, then the Bellows will need to be turned the wrong ſide upward; and the outward Valve of the Braſs Pipe muſt be taken off, or kept open, and the innermoſt Valve ſuffered alone to play. In which caſes, working gently with the Bellows, you may either charge, or diſcharge (as I may ſay) the Air-Chamber at your

your pleaſure, and conſequently, obtain an Air in it, of what rarity or denſity you pleaſe. The meaſure of which variety, that you may the more exactly take an account of (and that there may be very little or no miſtake in the uſe of this Chamber) it will be abſolutely neceſſary, to have conſtantly with you, a large Weather-glaſs: And you may likewiſe have a Tube of glaſs, of ſome forty inches long, filled with Quick-ſilver, and inverted into a little Earthen or Wooden Veſſel, half filled, with a quantity of the ſame material, after the manner of the Torricellian experiment; and theſe are to ſerve you for Regiſters: for by the aſcent, and deſcent of the Water, in the

Weather-

Weather-glaſs, will be noted to you, by the degrees, on the neck of the Glaſs, in what propor-tion you have either rarified or condenſed the Air within the Room: and you may by help of it, rectifie the tone of the Air, to what degree is requiſite, or injoyned. The uſe of the Quickſilver Tube is the very ſame, but will not give ſo exact an account, of every ſmall dif-ference, as the former, by rea-ſon of the ſmall quantity of Air contained in it: but yet will not want its uſe in other expe-riments, not relating to Phy-ſick, which I ſhall not here touch upon, as too remote from what we here handle. Such therefore, as imploy this con-trivance, only in Relation to

their Health, may content themſelves with a Weather glaſs, which will prove much an exacter Regiſter, than the Quick-ſilver Tube, as hath been already ſhewed.

11. As to the particular application of the uſe of the newly deſcribed Domicilium, or Air-Chamber, 'twill not be amiſs to repeat, what we before aſſerted in the precedent Chapter; namely, that as health it ſelf, is maintained by a due and ſuitable fermentation of the humors in our bodies, and that within a certain latitude: So, if the irregularity of the ſaid motion, or fermentation, be great enough, to become the cauſe of the manifeſt abolition, or weakening only, of any action of our bodies,

dies, the party ſo affected, is ſaid to be ſick, or diſeaſed; and as all diſeaſes may be divided into acute, whereto are thoſe of ſhort continuance to be referred (though they are not uſually termed Acute, taking the word more ſtrictly) and Chronical affections: or elſe (which comes to the ſame thing) they may properly enough be divided into diſeaſes, participating of heat, or of cold. The former of which we have already defined, to depend upon ſuch an irregular fermentation of the blood, and Maſs of humors, wherein the ſame are more violently moved, than is conſiſtent with health: of which kind are all continual and intermittent Fevers, all Inflammations, moſt

Fluxes, and ſeveral other diſtempers: and contrariwiſe, all Chronical, or cold affections, ſeem to depend upon ſuch an irregularity of the foreſaid Fermentation, whereby the humors are not ſo ſufficiently moved, and agitated, as is requiſite to health; of which kind are the Scurvey, the Rickets, all Dropſies, ſome Fluxes, moſt affections of the Spleen, and probably the Gout, and other Arthritical diſtempers. Now the method of uſing this Domicil, or Air-Chamber, in general, will be this, that where the diſeaſe ſeems to depend upon a deficient Fermentation of the humors, in ſuch caſe, the Patient (being put into the ſaid Chamber, and the door cloſe ſhut) ſhall, by degrees,

grees, diſcharge the ſame, or force the air out; till having conſiderably alter'd the tone, and rarified what remains, he ſtill finds himſelf to breath freely, or at leaſt with no great difficulty; at what time he may obſerve, how low the water is deſcended in his Regiſter, or Weather-glaſs, which will ſhew him how far he may ſafely, at another time, diſcharge the air, without danger of Cramping; which uſes to enſue, if the air be too exceedingly rarified. On the other ſide, if the diſeaſe be Acute, and ſeem to depend upon the too violent Fermentation of the humors, then it is neceſſary the Chamber be well charged with air, to what degree of Toleration ſhall ſeem

convenient. And here we are principally to provide, that no difficulty of breathing enſue, which oftner happens in this practice of condenſed, than attenuated air. Now the term of the Patients continuance in the Chamber, at one time, is to be defined in Chronical diſeaſes, as well from his own occaſions, as other circumſtances; and generally two, three, or more hours, may ſeem ſufficient, and that eſpecially in the morning, when the uſe of other Remedies are found moſt conducible. But in acute diſeaſes, it ſhould ſeem neceſſary, that the Patient continued in the ſaid Chamber, during the whole courſe of the diſeaſe, and that the tone of the air be prudently altered,

altered, after the directions of ſome able Phyſicians, according as the times of the diſeaſe ſhall ſeem to require; eſpecially in intermittent Fevers, where the time of the whole Paroxyſm muſt be ſpent in the Chamber, and the cold fit requires to be treated as a cold diſeaſe, with rarifying the air, as the hot fit, by condenſing it, which muſt be carefully obſerved. Now though there may be many diſeaſes, as the Stone, the French Pox, and ſome other, which do not depend ſo immediately, upon the aforeſaid irregularities of the Fermentation of the humors; yet I ſhould not doubt even in theſe, to commend the uſe of this Domicil, or Air-Chamber: for that while Na-

ture is thereby much ſtrengthened in all her Natural Functions, it muſt needs follow, that ſhe will from hence, at leaſt, be enabled the better to endure the conflict with thoſe diſeaſes, if, at laſt, ſhe do not wholly get the better of them. It will farther be neceſſary here to add, that in maligne diſeaſes, and where we require an amendment of the inſenſible tranſpiration; we are, as in cold diſeaſes, to rariſie, and not condenſe the air in the Domicil, where the Indication is rather preſervative, than curative, as Phyſicians uſe to ſpeak.

12. To ſay ſomething of the uſe of this contrivance, in time of health, we ſhall only propoſe it, as a good expedient to help

help digeſtion, and eſpecially inſenſible tranſpiration, and facilitate breathing and expectoration; and conſequently, as of excellent uſe, for prevention of moſt affections of the lungs, where they are feared; and that generally, whatever the benefits of changing the air, are, may be reaſonably expected from the uſe of this Domicil; and that after a more certain regular way, than without it, for that by the means of it, a perſon may ſerve himſelf with ſuch air, as were not otherwiſe to be found, but on the top of the Pike of Teneriff, or ſome other very high Mountain: nay, if it were convenient, as perhaps it may in ſome very contumacious affections, he may rarifie the air

to a far higher degree, and make it ſuch, as is not again to be found upon the face of the whole inhabitable world. But as well in ſickneſs, as in health, thoſe great exceſſes are not to be ventured upon, but by degrees. The uſe of this Domicil may be farther extended, for preventing the inconvenience which may enſue, upon any great change of air, by travelling into forreign Countries; whereby a perſon may at pleaſure reduce the tone of the air, to that of his own Soil or Climate: and probably, if the ſame might be made uſe of aboard Ships, it would (with the additional contrivance of a Chair, or Bed, hung after the manner of a Sea-Compaſs) prevent that very

trouble-

troubleſome affection whereto freſh men are ſo ſubject, called Sea-ſickneſs; and conſequently, become very ſerviceable to ſuch, whoſe imployments engage them to undertake Voyages into very remote parts, and there to reſide, far from their own Countries. There may, I doubt not, ſeveral other conſiderable concluſions be performed, by means of this contrivance: As alſo, that the thing it ſelf is very capable of good improvement, as to the projection of it, far beyond that deſcribed by us. All which, together with what hath been already ſaid, and undertaken by us, on the behalf of it, we leave for farther diſcovery and confirmation, to practice and experience.

13. Among the improvements which this contrivance of an Air-chamber is probably capable of, it is in my judgment none of the leaſt that may be obtained, by joyning the practice of *S. Sanctorius*, in his *Medicina Statica*, to this of ours. For as the promotion of the tranſpiration by the habit of the body (than which, nothing conduces more to the preſervation of health, and prevention of diſeaſes) is one of the moſt conſiderable among thoſe many benefits we promiſe our ſelves by it: So, if we ſhall have, as *Sanctorius* directs, a *Statera Romana* in our Air-chamber, it will be of very great conſequence for aſcertaining the Methodical uſe of it,

it, whereby it will become leſs ſubject to gheſs or hazard. For, as the Weather-glaſs before-mentioned will diſcover to us the degrees of rarity and denſity, introduced in the incloſed air: ſo the Balance will with the ſame exactneſs inform us, at what rate this *Diaphoretical* tranſpiration is either improved or abated: and at the ſame time give us the true weight (in Ounces and Drachms) of thoſe inſenſible *Effluvia*, which continually paſs that way. For the Patient weighing himſelf (for inſtance) firſt at ſeven of the clock in the morning, and again at nine or ten (having firſt exonerated himſelf) and abſtaining from meat and drink in the mean time; ſhall there-

by

by perceive how much (by weight) of his Aliment, or rather of the unprofitable part thereof in thoſe two or three hours, paſſed inſenſibly through the pores of his body. Let him again repeat the ſame Experiment the day following, with the ſame circumſtances, in the Air-chamber: and he will not be a little ſurprized to find half ſo much more, and perhaps twice the quantity evacuated after the ſame inſenſible manner (or *è contra*) and that in ſuch proportion, as he ſhall have ſuffered more or leſs of the included air, to have paſſed into the circumſtant Medium (or *è contra*) of what proportion the Weather-glaſs, as a faithful Regiſter, ſhall give him a very particular account.

account. I will not farther enlarge upon this additional practice of the Scale or Balance: much leſs add any thing of the uſe of inſenſible Tranſpiration, leſt I might offend ſuch as are better verſed in Statical Experiments; by the unprofitable repetition of what they are already ſo well acquainted with: or by giving an ill account of a Book I have but once read over, and that near twenty years ſince, deprive others of that ſolid benefit they may receive, by peruſal of the above commended Treatiſe of *Sanctorius*.

14. As this contrivance of the Air-chamber, is beſt fitted for the improvement of health, and the aboliſhing ſuch Morboſe

Cha-

Characters, as depend upon the over-flow or too nimble fermentation of the Humors: So it were eaſie to project great Veſſels, after the manner of Cupping-glaſſes, ſome capable to receive the whole Thighs, others fitted for the Arms: whereby we may at pleaſure, (as the ſeat of ſome particular diſeaſes ſhall direct) make ſuch powerful revulſions, as ſhall not only be ſufficient to charm, as it were, and diſpoſe of ſuch Humors as Phyſicians call *Turgid*, and *Motu Peccantes*: but even diſcharge particular parts of ſuch humors as have ſeated themſelves there already; and may, beſides that of Cupping-glaſſes, very fitly ſupply the place of the ſtrongeſt Ligatures. Which practice,

as

as it may be very available in moſt affections of the head: In inflammations, or other tumors or charges of particular parts: So (not having yet had ſufficient opportunity to confirm this my Opinion, by the frequent uſe of it) I ſhall content my ſelf at preſent with having done little more than naming it only.

15. I ſhall add farther, that the uſe of this Air-chamber may, in ſome caſes, but after a weaker and more uncertain manner, be ſupplied by a long ſitting-ſwing, which is found to be a very agreeable exerciſe, by moſt people that have uſed it: if their bodies have not been very impure, or firſt duly prepared. and by it many perſons, affected with Chronical diſtempers taking

king their original from a deficient fermentation, have found benefit. For, motion conducing ſo much (as hath been ſaid) to the exciting of all Fermentation, (which is viſibly in Syrups, and other juyces of Vegetables ſhaken, and as a proof of it, that Brandy Wine is accounted the beſt, that upon ſhaking, bubbles and works moſt) no wonder if the ſeaſonable continuance of this moderate, reciprocal motion of the Swing, do by degrees (though not ſo ſuddenly as in the forementioned inſtances of Syrups, &c. becauſe the humors in our bodies lie not ſo looſely as they, in Veſſels of glaſs or ſtone) produce the ſame effect, we obſerve without, in other liquors.

Nor

Nor is the fermentation (or call it, concoction) of the humors in their Veſſels, hereby only advanced: But likewiſe the diſtribution of the firſt, and ſecond ways, (if I may ſo call them) is very much promoted: For ſtill, as the body is carried forward, ſo often are the Abdominal Muſcles, gently and equally compreſſed, whereby the Chyle is the more nimbly protruded from the Inteſtines forward, to mingle with the blood. And again, upon the receſs of the body, the Abdomen being leſs compreſſed, than if the body ſet ſtill in the ſame ſcituation, is more dilated than uſually, and conſequently receives the Chyle flowing more plentifully from the Stomach into

into the Inteſtines. So that, if it come faſter into the guts, and be driven faſter out, it muſt of neceſſity follow, that the diſtribution thereof ſhall be more readily performed. Now, for what we lately called the diſtribution of the ſecond ways, that ſeems, by the uſe of the Swing, to be improved after this manner: while the body moves forward, as the fore-parts are more compreſſed by the *Medium*, ſo the back parts are leſs compreſſed (and thereby, as we may ſay, their tone weakened) whereby the habit doth not ſo forcibly reſiſt the afflux of humors flowing to that part: as in its middle, natural, and quiet ſituation. And thus reciprocally, firſt one part, and then

the

the other, are ſomewhat better diſpoſed for the reception of their Alimentary juyces, which I call the diſtribution of the ſecond ways. And thus much may ſuffice to have been ſaid at preſent, concerning this matter. I ſhall only deſire my Reader, that he will not be over precipitous, nor let the novelty of our Attempt ſurprize him to a prejudice: and that he be firſt, for his own ſake, well aſſured, he is Maſter of thoſe principles upon which this Fabrick of ours (as upon ſo many goodly Pillars) ſtands erected, before he proceed to condemn us. But if upon the ſerious peruſal of this Treatiſe, by ſuch whoſe Authentick Cenſure we moſt value and reverence, we happen

to

to be found light in our own Balance: We have at leaſt to plead, that we have neither miſpent much of our own, or their time in writing or reading of it. And that though we failed, the deſign was great and honourable, and directed to the benefit of Mankind, which may in good part plead our excuſe, and their good favour make out the reſt.

FINIS.

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